

# MAGAZINE **BSD**

**For Novice and Advanced Users**  
**Open Storage** issue!

**4 Interviews:**

Amazon Web Services

**iXsystems**

Open Source  
Storage

**HTML24**

**FreeNAS**

Home Server Build

**7 Best Practices**  
for Your Enterprise's  
Journey to the  
**Cloud**

**To SLOG or not to SLOG:**

How to best configure your ZFS  
Intent Log



# FREENAS MINI STORAGE APPLIANCE

IT SAVES YOUR LIFE.



## HOW IMPORTANT IS YOUR DATA?

Years of family photos. Your entire music and movie collection. Office documents you've put hours of work into. Backups for every computer you own. We ask again, *how important is your data?*

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Losing one bit - that's all it takes. One single bit, and your file is gone.

The worst part? **You won't know until you absolutely need that file again.**



*Example of one-bit corruption*

## THE SOLUTION

The FreeNAS Mini has emerged as the clear choice to save your digital life. **No other NAS in its class offers ECC (error correcting code) memory and ZFS bitrot protection to ensure data always reaches disk without corruption and *never degrades over time.***

No other NAS combines the inherent data integrity and security of the ZFS filesystem with fast on-disk encryption. No other NAS provides comparable power and flexibility. The FreeNAS Mini is, hands-down, the best home and small office storage appliance you can buy on the market. **When it comes to saving your important data, there simply is no other solution.**

### The Mini boasts these state-of-the-art features:

- 8-core 2.4GHz Intel® Atom™ processor
- Up to 16TB of storage capacity
- 16GB of ECC memory (with the option to upgrade to 32GB)
- 2 x 1 Gigabit network controllers
- Remote management port (IPMI)
- Tool-less design; hot swappable drive trays
- FreeNAS installed and configured



<http://www.iXsystems.com/mini>





# FREENAS CERTIFIED STORAGE



With over six million downloads, FreeNAS is undisputedly *the* most popular storage operating system in the world.

Sure, you could build your own FreeNAS system: research every hardware option, order all the parts, wait for everything to ship and arrive, vent at customer service because it *hasn't*, and finally build it yourself while hoping everything fits - only to install the software and discover that the system you spent *days* agonizing over **isn't even compatible**. Or...

## MAKE IT EASY ON YOURSELF

As the sponsors and lead developers of the FreeNAS project, iXsystems has combined over 20 years of hardware experience with our FreeNAS expertise to bring you FreeNAS Certified Storage. **We make it easy to enjoy all the benefits of FreeNAS without the headache of building, setting up, configuring, and supporting it yourself.** As one of the leaders in the storage industry, you know that you're getting the best combination of hardware designed for optimal performance with FreeNAS.

## Every FreeNAS server we ship is...

- » Custom built and optimized for your use case
- » Installed, configured, tested, and guaranteed to work out of the box
- » Supported by the Silicon Valley team that designed and built it
- » Backed by a 3 years parts and labor limited warranty

As one of the leaders in the storage industry, you know that you're getting the best combination of hardware designed for optimal performance with FreeNAS. **Contact us today for a FREE Risk Elimination Consultation with one of our FreeNAS experts.** Remember, every purchase directly supports the FreeNAS project so we can continue adding features and improvements to the software for years to come. **And really - why would you buy a FreeNAS server from *anyone* else?**



### FreeNAS 1U

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- Up to 16TB of storage capacity
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- Up to 48TB of storage capacity
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- 4 x 1GbE Network interface (Onboard) - (Upgradable to 2 x 10 Gigabit Interface)
- Redundant Power Supply

<http://www.ixsystems.com/storage/freenas-certified-storage/>





## Dear Readers,

The holiday season is almost over. We have only one "holiday" left this month - Valentine's Day. Do you count it as a holiday? Do you celebrate other holidays this month? Let us know, we love to learn more about you!

You will not find hearts in this issue. You don't have to expect red and pink colours either, but if you like to celebrate the holiday of love, I would like to wish you an amazing time with beloved ones.

Moving on to the issue, this time we would like to focus on the subject of open storage. You will find three great interviews with Matt Olander from iXsystems, Eren Niazi from Open Source Storage and Guilem Veiga from Amazon Web Services; a perfect comparison of different approaches to storage solutions. As a bonus, you will find an interview with Bo Møller, the young Danish entrepreneur and founder of HTML24. Must read, these guys do an amazing job.

Slightly to the side of the topic of open source, we have "Technology Trends in 2016" by Dr Werner Vogels, CTO of Amazon.com.

Most important for this issue, our storage articles will start with "To SLOG or not to SLOG: How to best configure your ZFS Intent Log" by Mark VonFange, then "FreeBSD and FreeNAS in Business" by your favorite blogger, Randy Westlund, and "FreeNAS Home Server Build Article" by a newcomer in our magazine, John Ramsden.

A little bit on The Cloud will begin with "7 Best Practices for Your Enterprise's Journey to the Cloud" by Stephen Orban, Head of Enterprise Strategy at AWS, and closed by "Cloud is Changing how Security Professionals and Enterprises Think about Innovation" by Steve Schmidt, Chief Information Security Officer, Amazon Web Services.

Before the column, you will find third article from GUI - Model View Whatever series by Damian Czernous.

In the end, as always, we have your favorite column by Rob Somerville. Quite controversial topic, isn't it? Let us know your thoughts!

Have an amazing February with or without celebrating Valentine's Day!

Love,

**Marta & BSD Team**



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## Technology

### [Technology Trends in 2016](#) **31**

*by Dr Werner Vogels, CTO of Amazon.com*

Technology and software is becoming integrated into every aspect of our personal and business lives and every year this integration gets deeper and deeper. Given the pervasiveness of technology in our lives, it is hard to cover all the trends that are impacting us, but in this article I will focus on a few we are seeing have an immediate effect on our customers around the world and what we can expect to see in the coming year. These trends are focused on simplification and how it is becoming easier for businesses to build highly effective applications that are secure and reliable and deliver great scalability and performance at the lowest possible cost.

## Storage

### [To SLOG or not to SLOG: How to best configure your ZFS Intent Log](#) **35**

*by Mark VonFange*

In the world of storage, caching can play a big role in improving performance. OpenZFS offers some very powerful tools to improve read and write performance. To improve read performance, ZFS utilizes system memory as an Adaptive Replacement Cache (ARC), which stores your file system's most frequently and recently used data in your system memory.

### [FreeBSD and FreeNAS in Business](#) **38**

*by Randy Westlund*

My father owns Charlotte Tent & Awning, a small business with about 30 employees, selling canvas and metal awnings to a wide variety of customers, from homeowners to massive shopping centers and sports stadiums. I'm going to tell you how FreeBSD and FreeNAS came to play a critical role in his business.

### [FreeNAS Home Server Build Article](#) **42**

*by John Ramsden*

I've spent the last couple months configuring and setting up a new home server, with the intent of using it as a storage and media server.

## Cloud

### [7 Best Practices for Your Enterprise's Journey to the Cloud](#) **56**

*Attributed to Stephen Orban, Head of Enterprise Strategy at AWS*

This article serves as an introduction to my new thinking, and lays out seven best practices I've seen in enterprises that are delivering results on their Journey. I'll dive deeper into each best practice and talk about some of the things I've seen work (and not work) for each as this series comes together. Because the cloud is disrupting the way IT is delivered and consumed, you have a tremendous opportunity to scrutinize and rethink the way IT operates in your organization.



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## Cloud is Changing how Security Professionals and Enterprises Think about Innovation **59**

*by Rob Somerville*

*Attributed to Steve Schmidt, Chief Information Security Officer, Amazon Web Services*

Think of your stereotypical security professional in your IT department. Usually extremely intelligent, risk averse, dashing good looks (if I do say so myself...) and the first person to shut down any new idea within an organisation.

## **GUI**

## Model View Whatever - Forms and Controls influence **61**

*by Damian Czernous*

In the '70s, engineers mostly worked on creating and manipulating widgets. The MVC seems to be the right structure for that task. Model fits the need of storing data related to the single widget. View renders graphical representation of the widget with data. Widgets communicate with each other through the model. The model using Observer Synchronisation broadcasts any changes to all interested widgets (views), so they can update. Separated Presentation and Observer Synchronisation are key mechanisms of MVC widely accepted by the engineering community.

## Column **65**

**With the recent revelations that Steve Jobs and many others in Silicon Valley consumed psychedelics to aid creativity, has the Valley finally sunk to the levels of other business sectors?**



## BSD Certification

**The BSD Certification Group Inc. (BSDCG) is a non-profit organization committed to creating and maintaining a global certification standard for system administration on BSD based operating systems.**

### ? WHAT CERTIFICATIONS ARE AVAILABLE?

**BSDA: Entry-level certification** suited for candidates with a general Unix background and at least six months of experience with BSD systems.

**BSDP: Advanced certification** for senior system administrators with at least three years of experience on BSD systems. Successful BSDP candidates are able to demonstrate strong to expert skills in BSD Unix system administration.

### ✓ WHERE CAN I GET CERTIFIED?

We're pleased to announce that after 7 months of negotiations and the work required to make the exam available in a computer based format, that the BSDA exam is now available at several hundred testing centers around the world. Paper based BSDA exams cost \$75 USD. Computer based BSDA exams cost \$150 USD. The price of the BSDP exams are yet to be determined.

Payments are made through our registration website:  
<https://register.bsdcertification.org/register/payment>

### i WHERE CAN I GET MORE INFORMATION?

More information and links to our mailing lists, LinkedIn groups, and Facebook group are available at our website:  
<http://www.bsdcertification.org>

Registration for upcoming exam events is available at our registration website:  
<https://register.bsdcertification.org/register/get-a-bsdcg-id>

## Open source plugin aims to defeat link rot

The death of URLs greatly exaggerated.

A new open source plugin designed to prevent the creation of dead content links online – so called "link rot" – has launched.

Amber has been designed by Harvard's Berkman Center for Internet and Society and it provides what it calls a "persistent route" to information on the internet by automatically taking and retaining a snapshot of every page on a website and storing it on the same website's server.

In other words, it's a Wayback Machine for your own website. Or perhaps think of it as a mirror of your website with minimal fuss.

If for whatever reason a URL goes dead, rather than returning a 404 error page, the tool should provide visitors with the relevant snapshot. The snapshots are stored on the same server as the website but can be configured to save them on third-party systems or in archival systems.

Perhaps unsurprisingly, the project has been supported by the Internet Archive (Wayback Machine), Amazon Web Services, and Perma.cc (another online archiving service).

[http://www.theregister.co.uk/2016/01/28/open\\_source\\_plugin\\_aims\\_to\\_defeat\\_link\\_rot/](http://www.theregister.co.uk/2016/01/28/open_source_plugin_aims_to_defeat_link_rot/)



## AsiaBSDCon 2016

### AsiaBSDCon 2016

Tokyo University of Science, Tokyo, Japan  
10-13 March, 2016

Tokyo University of Science, Tokyo, Japan  
10-13 March, 2016

AsiaBSDCon is a conference for users and developers on BSD based systems.

The next conference will be held in Tokyo, in 10-13 March, 2016. The conference

is for anyone developing, deploying and using systems based on FreeBSD, NetBSD, OpenBSD, DragonFlyBSD, Darwin and MacOS X. AsiaBSDCon is a technical conference and aims to collect the best technical papers and presentations available to ensure that the latest developments in our open source community are shared with the widest possible audience.

<https://2016.asiabsdcon.org>

## Red Hat plants containers as Jboss EAP 7 bursts into beta



Red Hat has kicked open the beta program for its Jboss Enterprise Application Platform 7, and planted containers right at the heart.

The vendor has deployed a panoply of keywords around the launch of the beta program, which it says will mirror enterprises movement “towards new application approaches that include containers, microservices architectures, and cloud environments”.

At the same time it will bring “enterprise Java squarely into that new world and also provides a bridge to give customers what they need to build and deploy applications of the future and refresh traditional Java EE environment”.

The latter comes through support for Java EE 7 and Java SE 8. The company is emphasising changes to maximise productivity and performance, including “batch tooling, which enables developers to more easily monitor, create, manage, and configure batch jobs”.

In addition to the updated old, it has apparently been built with containers and “resources-conscious virtualised or cloud environments”, such as Red Hat’s own OpenShift. This includes a low-memory footprint, faster startup and optimised network port utilisation. All of which should come in handy, should containerisation really become a thing.

[http://www.theregister.co.uk/2016/01/18/jboss\\_7\\_beta\\_launched/](http://www.theregister.co.uk/2016/01/18/jboss_7_beta_launched/)

## FreeBSD Patches Kernel Panic Vulnerability



FreeBSD has patched a denial-of-service vulnerability affecting versions configured to support SCTP and IPv6, the default configurations on later versions of the open source OS.

Researchers at Positive Technologies in the U.K. said versions 9.3, 10.1 and 10.2 are affected and can be exploited by a specially crafted ICMPv6 packet, which will cause a kernel panic; kernel panics are the UNIX equivalent of a Windows Blue Screen of Death.

An advisory from FreeBSD says kernels compiled without support for SCTP or IPv6 are not vulnerable. SCTP is the Stream Control Transmission Protocol, used to facilitate communication between endpoints on the same network. The vulnerability is exploitable remotely and without authentication, FreeBSD said.

<https://threatpost.com/freebsd-patches-kernel-panic-vulnerability/116001/>

## AMD emits fresh open-source GPU tools for HPC, game devs

AMD has fleshed out its notion of an openly defined GPU architecture, GPUOpen, with the launch of a bunch of open-source tools on GitHub plus a shiny new website.

The move has been welcomed by the gaming press, but GPUOpen is not all about blasting people in 3D death matches – AMD also has the high performance computing (HPC) community in mind. The “Professional Compute” side of the initiative brings together tools like:

- HIP – described as a portable C++ runtime and kernel language for GPUs, with tools to help migrate CUDA code into C++.



- ContinuumAnalytics' HSA-accelerated Python.
- The open source HC Compiler for C++ code.
- HSAIL debugging, an OpenCL-based system health monitor, and a bunch of different HPC-targeted libraries and applications.

AMD's Greg Stoner, senior director Radeon Open Compute, said that for GPUOpen, “we have rebuilt our core foundation on how you access our GPU resources starting from the driver, runtime, compilers and even the programming languages.”

He also announced the Lightning Compiler Initiative, which will feed into AMD's existing Boltzmann Initiative. Announced in September 2015, Boltzmann includes a Linux driver for cluster-class GPUs, and an HPC-optimised HSA+ (heterogeneous system architecture) runtime.

For the game devs, there's code and documentation to give them more control over the GPU, with GPUOpen software hosted at GitHub to keep that collaboration-love ticking along. Game and graphics tools in GPUOpen include:

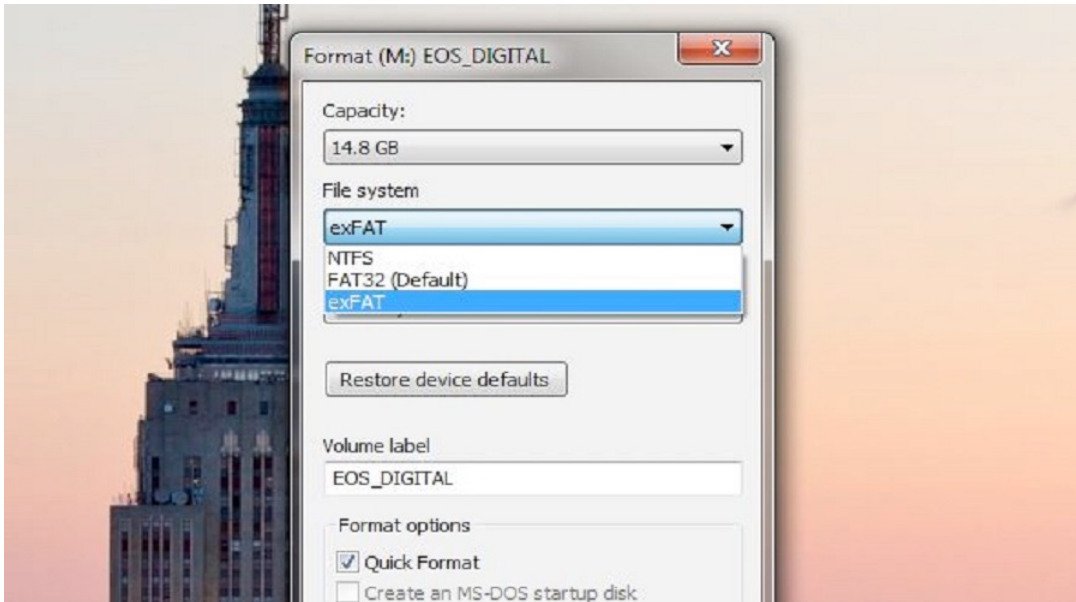
- The CodeXL Analyzer CLI – offline compilation and performance analysis for OpenCL kernel, DirectX shaders and OpenGL shaders.
- A DirectX plugin offering debugging tools like API trace, GPU trace, linked trace and an object inspector.

[http://www.theregister.co.uk/2016/01/27/amd\\_opening\\_up\\_gpu\\_for\\_hpc\\_and\\_game\\_devs/](http://www.theregister.co.uk/2016/01/27/amd_opening_up_gpu_for_hpc_and_game_devs/)

## FAT32 vs. NTFS vs. exFAT – Difference Between Three File Systems

FAT32, NTFS, exFAT are three different files systems used to store data in a storage device. Created by Microsoft, they have their pros and cons which you might want to know and will allow you to use them wisely.

When we talk about the Windows OS, we realize that the operating system installs on a partition formatted with the NTFS file system. For removable drives and another form of USB interface-based storage, we use FAT32. Additionally, the removable drives and memory cards can also be formatted with the exFAT file system, which is a derivative of the old FAT32. \



## NTFS vs FAT32 vs exFAT – Comparison

### FAT32:

Compatibility: Windows, Mac, Linux, gaming consoles, practically any device with a USB port.

Pros: Cross-platform compatibility, lightweight.

Cons: Limited file size (up to 4GB) and

partition size (up to 16TB).

Usage: Removable storage devices.

### NTFS:

Compatibility: Windows, Mac (Read-only), Linux (read-only for some distributions), Microsoft Xbox One.

Pros: Inexhaustible limits for file and partition size.

Cons: Limited cross-platform compatibility.

Usage: Best for internal hard drives. Use it for Windows system drive and any other system partition which may be used to install software.

### exFAT:

Compatibility: Windows XP and later versions, Mac OSX 10.6.5 and above, Linux (using FUSE), Android.

Pros: Behaves as a fusion between FAT32 and NTFS by providing practically unlimited file size and partition size.

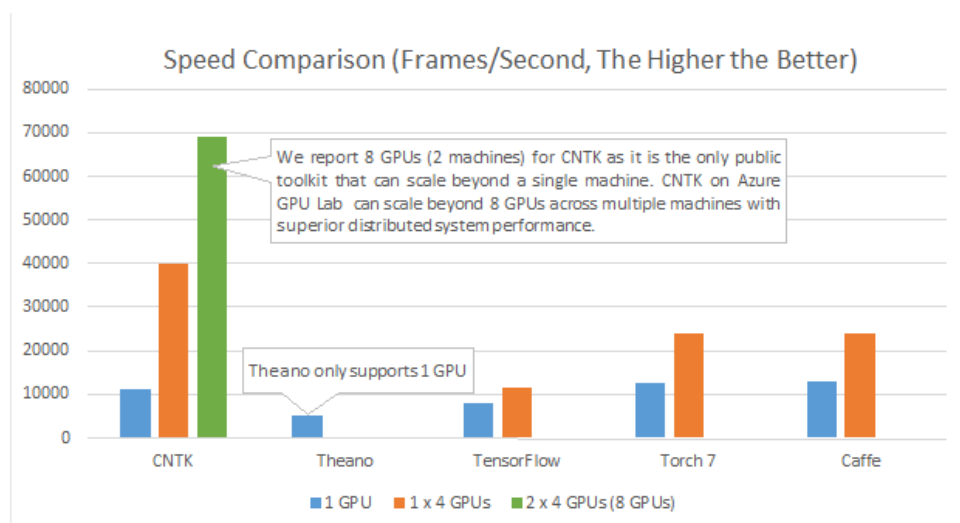
Cons: Microsoft restricts its usage by license obligations.

Usage: Use with external hard drives or flash drives if you want to transfer files larger than 4 GB. Always prefer exFAT over FAT32 if the operating supports it.

<http://fossbytes.com/fat32-vs-ntfs-vs-exfat-difference-three-file-systems/>



## Microsoft Open Sources Its Deep Learning Toolkit, Releases CNTK Code On GitHub



Redmond has open sourced its Computational Network Toolkit (CNTK) on GitHub. This toolkit has the ability to combine deep neural networks applications with multiple GPUs for faster results. The CNTK toolkit is “just insanely more efficient” than anything we have ever seen, according to Microsoft.

Microsoft has open sourced its Computational Networks Toolkit and made it available for every-

one on GitHub. It’s a unified deep-learning toolkit that makes use of deep neural networks and GPUs for faster results. The company is currently using the same in the speech recognition and AI projects.

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## Under an open source model, developers tend to write better code



*Matt Olander from iXsystems*

*by Marta Ziemianowicz, Marta Strzelec & Marta Sienicka*

**[BSD Magazine]:** Hello Matt, how have you been doing? Can you tell our readers something about yourself?

**[Matt Olander]:** Hello! Sure! In a nutshell, I am fascinated with technology, in general, and especially mesmerized by computers and operating systems. When I'm not on a computer, I'm probably at the gym, thinking about being on a computer ;)

In my copious free-time, I enjoy attending open-source trade shows and meetups, demonstrating the virtues of PC-BSD, FreeNAS, and FreeBSD.





# INTERVIEW

**[BSD Mag]: Can you tell us, what iXsystems is about? What is the idea behind it and its history?**

**[MO]:** Absolutely. The idea behind iX was to create a company that treated employees like family and clients like partners. I knew that if I could find people like myself, with a passion for open source that enjoyed working on software and systems so much that it didn't even feel like work, it'd be an awesome fsck'ing place, right from the start. We wanted to build the kind of company that would make people wonder what it was like to work at, and if it's really as fun as it seems.

Yes, it is as fun as it seems. We definitely succeeded. Our dirty little secret is that almost everyone at iX would continue to do what they do now, even if they weren't paid to do it. We love what we do and when your work is your play, you'll never work another day in your life.



Frankly, I feel honored and privileged to work side-by-side with some of the most passionate and brightest people in our field. It's a rare opportunity to collaborate with the rock stars of open source.

We're in the very same building, in the middle of Silicon Valley's "golden triangle", where BSDi shipped the world's 1st integrated rackmount-servers running BSD/OS. We've got the original BSDi sign that was in the front-office and one of our bright engineers just got BSD/OS up and running for fun. We have a display case with every version of PC-BSD that's shipped, and one with all the BSD Magazines that were printed, too ;)

iXsystems is about sharing our love of operating systems and hardware with the world.

**[BSD Mag]: Do you have any favorite memory/moment while working in iX that you could share with our readers?**

**[MO]:** So many! Here is an iX story that still makes me laugh. We hired our esteemed webmaster many years ago. His name is James Nixon and he is a pretty familiar sight at North



American open source tradeshow, helping me to spread the good word about BSD.

The first year that James was here, we went up to a show in Oregon, I think it was OSCON, by O'Reilly, a great show that we've been going to for years. Usually, I'll hang out at the FreeBSD booth or FreeBSD Foundation table, giving out some daemon horns, and doing demos while we show off some of the new features for the latest release.

Our webmaster (now he demands I call him devops cloud-casting sorcerer) really got into PC-BSD, our user-friendly FreeBSD build. He had it installed on his laptop and was showing people that you really can watch videos, surf the web, and develop web apps and other software on a BSD laptop ;)

Well, a familiar face walked up to the FreeBSD table, but his conference-badge was turned around so James could not see the name. Knowing who it was, I had to try really hard not to burst out laughing as James haltingly explained why FreeBSD was so awesome to...Jordan Hubbard, the co-founder of the FreeBSD Project. It was pretty funny to see James turn red once he found out, after Jordan asked many many good questions!

**[BSD Mag]: What storage solutions can you recommend?**

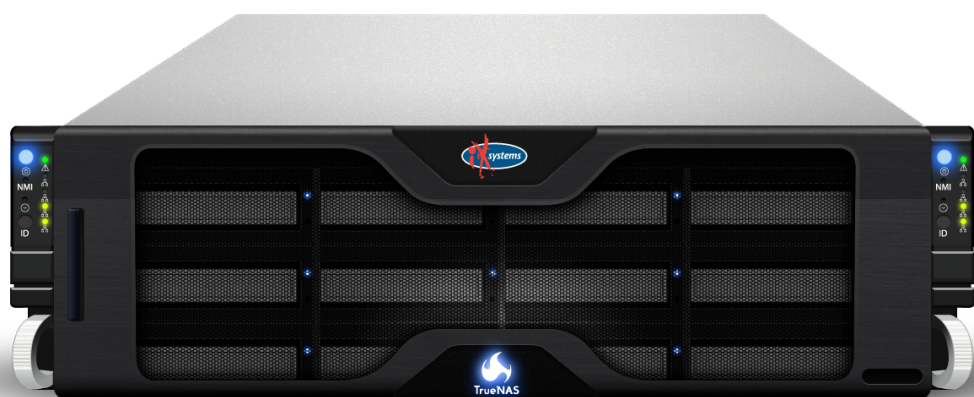
**[MO]:** Hrm...let me think on this for a second...ummm...could it be...OH! I KNOW! FreeNAS ;)

Really, there are so many options and possible variations in builds and requirements, it provides endless configurations. Our Solutions Engineers might get an incoming inquiry that a small, inexpensive set-top box with a few drives would be a decent solution for one person but then in the next inquiry, you have a streaming-video company that needs to replicate data between data centers across the continent.

In fact, when we became the caretakers of the FreeNAS Project, we wanted to support everyone that was running FreeNAS on everything and anything (yes, even on a Raspberry Pi).

Since so many people, all over the world were running FreeNAS on anything and everything, we realized that in order to provide the highest level of service, we'd need a qualified platform.

So, we designed and produced the TrueNAS Storage Appliance. It's something that everyone on our team is really proud of and they should be, since it's a wonderful accomplishment and an outstanding solution that runs on some really sweet gear. It's what we would buy and we're pretty picky (and frugal!).





**[BSD Mag]: Can you tell us more about TrueNAS Storage Appliance?**

**[MO]:** I can! TrueNAS takes everything that is absolutely awesome about an opensource development methodology and combines it with our decades of \*NIX experience, manufacturing, and systems integration knowledge. The result is a hardened, reliable, battle-tested, opensource storage solution that is built for the Enterprise.

FreeNAS is terrific. If you can get away with it, you should. I did. Sometimes though, you need a helping hand, a support contract, some deployment recommendations, and a truly dedicated partner that has done it a few times already.

Either way, you get the result of our many years of opensource passion.

**[BSD Mag]: What challenges did you face when you decided to turn the idea into reality?**

**[MO]:** It is like Isaac Newton might have said; ouch, apples. Seriously, the time was right and I felt that there may never be a better chance in this life to launch a BSD-based company like iXsystems. If it were too easy, it would not have been half the fun, and we would all start one.



We all worked long hours, 7 days a week, for months on end, with no pay until some point into our 2nd year. We would do it again in a heartbeat.

**[BSD Mag]: Which open source software supports iXsystems products? Why those ones?**

**[MO]:** Of course we support the FreeBSD Project & Foundation, PC-BSD, FreeNAS, Slackware (since the Walnut Creek CD-ROM days), Network Time Foundation (nwttime.org), and make smaller donations to many other opensource projects.

I wish we could support more!

**[BSD Mag]: What do you think about using open source systems? What is their advantage other than being free?**

**[MO]:** The opensource methodology of development, release, and quality-assurance and control is superior compared to the same software developed behind closed doors and closed-source. Because the opensource development model is typically transparent and collaborative, you have to be a bit brave (and crazy) to do it out in the open.

Under an opensource model, developers tend to write better code, especially knowing that their peers will see it.

That and the fact that immediate feedback and suggestions come right back, allow rapid iteration of the software, out in the open, where everyone can see and collaborate.



# INTERVIEW

We are free-thinkers and we feel that information should be shared as much as possible. This is at the very heart of the business-friendly, permissive BSD license. It's truly free, without encumbrance whatsoever.

**[BSD Mag]: What do you think about IoT? It's a very hot topic at the moment and a very broad one.**

**[MO]:** Eventually, everything will be networked to everything else. I think it's both amazing and a bit scary. We barely know what we are doing and when you link an automated machine-gun on a turret to wifi, trouble is sure to follow.

However, once we have cranial internet implants, I'd probably be a big enough idiot to have the beta ;)

**[BSD Mag]: Do you think that by the time cranial internet implants will we possible IoT security will have been improved? Right now it seems so many connected things remain unprotected.**

**[MO]:** That is a very valid point. Seriously, I hope so. If not, I am sure my aluminum foil

pointyhat will protect me. But I'll be running a pf firewall, just in case ;)

**[BSD Mag]: Have you met the people behind BSD? Is that why you have decided to build your products on this operating system?**

**[MO]:** Haha, not only do I meet them but I frequently get to work with them! In fact, one might say that I'm one of them ;) Yes, even before my time at BSDi, I was already a fan of the BSDs and working with many of the core contributing individuals and companies has only strengthened our conviction that BSD software and methodology is superior to the alternatives.

Besides, BSD people make and drink great beer ;)





**[BSD Mag]: What is the most favorite beer style among BSD developers? Perhaps an amber ale that goes well with the BSD daemon?**

**[MO]:** Ah, a topic near & dear to many a BSD user and contributor!

In fact, we met one of our Senior Developers, John Hixson, at the pub! If I recall, he was drinking a stout but I had a lager, so it wouldn't slow me down. It turns out we were both in the same city, going to the same conference, BSDCan in Ottawa, Canada. That was probably 8 or 9 years ago.

**[BSD Mag]: Are there any challenges iXsystems has to face at the moment?**

**[MO]:** Sure, there are always challenges. For instance, how to attract and retain excellent people is a challenge that any company has to face. Because we are in the Silicon Valley, it's even harder sometimes. Besides that, there are always many competitors and since most of them will put profits above people, it can make it difficult for us.

We do alright, though. We're still fairly small and agile, we're privately held, and everyone at iX participates in the success. The company has zero debt and no Venture Capital firms are banging loudly for a return on their

investment at the expense of the company mission.

We do not mind challenges at iX ;)

**[BSD Mag]: Any plans for the future? What is the next step in iXsystems' innovation?**

**[MO]:** Besides some pretty exciting changes to FreeNAS, we have really cool things coming in PC-BSD.

We also have some fantastic technology to add to the mix in the virtual machine and container orchestration market.

And...a little daemon told me that some Cloud offerings are close at hand!

**[BSD Mag]: Is there anything you would like to tell our readers? Any piece of advice?**

**[MO]:** I would just like to thank everyone that has tried, used, contributed, or even complained about BSD. The resulting technology is a mixture of all these things and more. If you are reading this wondering how you can get involved, just remember, opensource projects always need some help, even if it's with content for a website, graphic art, system administration, documentation, public relations, marketing, and of course, coding.

May the Source forever be in your favor.



## Today, AWS is the fastest-growing multi-billion dollar enterprise IT vendor in the world.

*Guillem Veiga from Amazon WebServices*



*by Marta Ziemianowicz, Marta Strzelec & Marta Sienicka*

**[BSD Magazine]:** Hello Guillem, how have you been doing? Can you tell our readers something about yourself?

**[Guillem Veiga]:** I am Guillem Veiga, Country Manager of AWS in Spain, I have over 11 years of experience in the IT industry, and have helped some of the biggest AWS Start-ups in EMEA during my time with the business. Now I lead the AWS team to support Spanish companies in their migration to the cloud. Our role, as a team, is to help the Spanish companies of all sizes to understand how they can take benefits of cloud computing to stimulate their business and better serve their own customers.

Enough about me however, let me tell you a little more about Amazon Web Services. Amazon Web Services (AWS) is the cloud computing part of Amazon.com. The company was launched in 2006 and gives any software developer or business the keys to one of the world's most reliable, secure, scalable, and

cost-efficient web infrastructures, which they can use to build and grow any business. This makes it possible for any business to reach the scale of major internet players like Amazon.com, but without the expensive price tag they would have to pay to build and maintain such a reliable, secure, and scalable infrastructure – all using cloud computing technology.

Many people ask about where the company came from – let me give you some insight. After over a decade of building and running the highly scalable web application, Amazon.com, the company realized that it had developed a core competency in operating massive scale technology infrastructure and data centers, and embarked on a much broader mission of serving a new customer segment—developers and businesses—with a platform of web services they can use to build sophisticated, scalable applications. Today, AWS is the fastest-growing multi-billion dollar enterprise IT vendor in the world.



AWS has more than one million customers in 190 countries taking advantage of the agility the model offers. The number and the variety of customers adopting the cloud demonstrate that the Cloud has become the new normal as companies of every size are now deploying new applications to the cloud by default, and looking to migrate as many of their existing applications as they can as quickly as possible.

For enterprises, the question isn't "if" anymore, it's really just "how fast can we move?" and "what are we going to move first?" As an example, in the last few years in Spain, we have seen customers like BBVA Data and Analytics, Securitas Direct, Interflora, 20 minutos and Odigeo have now passed the experimentation stage and are using AWS as the default for their new applications and mission critical workloads. This is allowing them to move from idea to launch as fast as possible. We don't see any sign of this growth slowing down and expect to see continued strong growth in our business in Spain, across Europe and around the world.

**[BSD Mag]: What storage solution do you recommend?**

**[GV]:** First, I think it is important to explain that AWS customers retain ownership and control of their content. They choose which location to store their data and it doesn't move unless the customer decides to move it. Today, the AWS cloud includes more than 50 different services offering the same high security level to all clients, including storage services such as Amazon Simple Storage Service (Amazon S3). Amazon S3 is the backend storage for some of the fastest growing small businesses in the world – such as Dropbox, Spotify and Netflix- as well as large enterprises in-

cluding Shell, News International and the European Space Agency. Photos, music, as well as business and financial documents are some of the things being stored in Amazon S3. AWS also offers Amazon Glacier – a secure, reliable and extremely low cost storage solution designed for data archiving and backup. Amazon Glacier is designed for data that is infrequently accessed, yet still important to retain for future reference. Examples include digital media archives, financial and healthcare records, raw genomic sequence data, long-term database backups, and data that must be retained for regulatory compliance.

We also have many storage services, including an object store, a block store, as well as an archival and backup store. We have six different database engines for our relational database service. We have a non-relational database service. We have a content distribution network with 54 points of presence around the world. We have networking features companies can layer on top of those core building blocks. We have a number of analytics capabilities including batch analytics, streaming analytics, and a data warehouse. Lots of mobile services, whether it's identity and sync, analytics, mobile push, or an API gateway. We have a number of deployment options, including containers, templates, and GUI. Or, customers can use our event driven computing service called AWS Lambda.

Our local team is here to support customers to find the model/design which fits with their need, we also have training materials and tutorials to help them to move to the AWS cloud: <https://aws.amazon.com/es/>

**[BSD Mag]: What do you think about IoT? It's a very hot topic at the moment and very broad one.**

**[GV]:** I think the Internet of Things makes everyday products smarter for consumers, and for businesses to enable better, data-driven offerings that weren't possible before. World-leading organizations, like Philips, NASA JPL, and Sonos, already use AWS services to support the back-end of their IoT applications. Now, AWS IoT, that we launched at ReInvent last year, enables a whole ecosystem of manufacturers, service providers, and application developers to easily connect their products to the cloud at scale, take action on the data they collect, and create a new class of applications that interact with the physical world. We see our customers are developing really interesting projects in the field of IoT. For example, Philips, a Dutch-based company, focuses on the areas of healthcare, consumer lifestyle and lighting products and services. The Healthcare Informatics Solutions and Services division of the company wants to reinvent healthcare for billions of people around the world and is building its Philips HealthSuite digital platform on Amazon Web Services (AWS). The Philips HealthSuite digital platform analyzes and stores 15 PB of patient data gathered from 390 million imaging studies, medical records, and patient inputs to provide healthcare providers with actionable data, which they can use to directly impact patient care. Running on AWS provides the reliability, performance and scalability that Philips needs to help protect patient data as its global digital platform grows at the rate of one petabyte per month.

And what I can tell you is that we are really excited to continue or to start working with our customers in order to help them to scale and innovate on their IoT projects.

**[BSD Mag]: You have been working in many different companies. What do you think about Spain. Is it an interesting country for IT related companies?**

**[GV]:** Here in Spain, we are having discussions with people who are so excited and so passionate about the cloud everyday. Since we launched the EU Region in November 2007, we have seen an acceleration of companies adopting the services and have been rapidly building local teams to work with customers to help them move to the cloud. In 2014, AWS opened a Spanish office in order to support the growth we are seeing in the country. We now have teams of Account Managers, Solutions Architects, Trainers, Professional Services, Technical Account Managers, Support Engineers, and many others, working with customers in Spain.

We work with customers in every vertical market, with almost every imaginable use case to move them to the cloud. As part of this, we are also supporting customers with Spanish language websites, trainings, webinars and staff in order to help them move to the AWS cloud in their local language. As a result of this investment, we now count some of Spain's hottest start-up companies as customers, such as SocialPoint JobandTalent or Interflora Spain, enterprise customers, like Securitas Direct, Odigeo eDreams and Bankinter, and public sector organizations, like Junta Andalucía, Instituto de Empresa and The University of Barcelona.



We can, for example, talk about MAPFRE which is using AWS for High Performance Computing (HPC) in order to calculate their solvency as a company. Every month, insurance companies have to make a company solvency check to test their risk under the worst case scenario. This requires putting all customer policies into mathematical calculations to check if the company has the ability to meet the payment of their debts. This means, if the company had to pay all its debts at once, would they have enough assets to meet these payments. Running these calculations requires expensive HPC machines that are only used a few times per month. Using AWS allows MAPFRE to spin up a supercomputer on demand and then shut it back down when they are finished, only paying for what they use. This is helping MAPFRE to make substantial cost savings. The on premises hardware investment for three years was estimated to be more than €1 million versus less than €180K through using AWS infrastructure over the same period.

**[BSD Mag]: Any plans for the future? Any expansion plan?**

**[GV]:** Amazon Web Services offers every customer the opportunity to develop their potential, through better understanding their customers, their market, and through innovation in the cloud. We will continue to help our customers to benefit from cloud technology and we will certainly look forward to being surprised by the new uses that will result!

Regarding expansion plans: we're constantly getting feedback from customers on what services and features they would like to see next and where they would like the next AWS Re-

gion. We have a long list that we are looking at and we're always re-evaluating and reprioritizing that list. In the fullness of time, you can expect more features and services from AWS and more AWS Regions in multiple major countries around the world.

**[BSD Mag]: Is there is anything you would like to tell our readers? Any piece of advice?**

**[GV]:** As Andy Jassy, our Senior Vice President said, the AWS Cloud movement is very much about giving builders freedom and control over their own destiny. It's about giving them hope that if they come up with an idea that can really change their business, either individually or as a group, they'll be able to go make it happen. I encourage your readers to become part of this journey to the cloud with AWS and take advantage of our partner ecosystem to support them in their ride.



**About  
Guillem  
Veiga**

Guillem Veiga, Country Manager of AWS in Spain.

Visit [@awscloud](#) for more info!

## Nothing is perfect, but open source is pretty dang close

*Eren Niazi from Open Source Storage*



*by Marta Ziemianowicz, Marta Strzelec & Marta Sienicka*

**[BSD Magazine]:** Hello Eren, how have you been doing? Can you tell our readers something about yourself?

**[Eren Niazi]:** I created Open Source Storage and was an early pioneer in the open source systems movement almost 25 years ago. At the age of 15, I envisioned the world running on open source software, and began to purchase all related domain names to brand what has now become an industry-wide term. I then went on to design and deploy many of the original open source systems for critical enterprise players, including Facebook and Shutterfly, which helped to fuel the origins of the open source movement.

My vision has always been to live in a world where we could freely and affordably create our dreams using readily available open source software. As a result, I've been able to help people create those visions, while at the same time enabling them to give back to the world and the open source community. If we can unite visionaries and keep software affordable, then we can begin to break out of the proprietary software mold that so often encumbers so many young inventors today. How-

ever, in order to accomplish this, the open source community needs to work together, allowing their collective visions to be created and then share the source code to make that technology free.

**[BSDMag]:** Tell us something about Open Source Storage. The name of the company is quite straight forward and clear, but let us know something more.

**[EN]:** My motto has always been to unlock technology for the community, which would allow all entrepreneurs and inventors to create their visions at an affordable rate. Although I have faced challenges in the past, OSS was my vision, and I'm proud to watch it begin expanding once again. I am here, and OSS exists, to try to make the world a better place for software communication.

**[BSDMag]:** Does OSS make a technology community a better place? Have you met with words of criticism regarding OSS?

**[EN]:** OSS is the original pioneer and evangelist behind the Open Source Storage and Systems movement.



I am also the evangelist and owner of Open Source Groups, the original core team, which helped pioneer and finance the community movement and help fuel Open Source in 1998.

I do believe OSS has made a difference by being the first company to take open source to the enterprise arena in the early 2000s. We have made a difference and have made a global shift to better mankind and to allow young entrepreneurs to build their dreams at an affordable cost. It's our goal to make not only the tech and open source communities — but essentially the world — a better place through collaboration and inspiration. Like everyone, we have had our share of criticism in the past, but it was mostly the result of a marketplace that wasn't ready to adopt open source for the enterprise; fear of change can often result in criticism of those driving the change.

**[BSDMag]: Can you see any downsides to open source or is it a perfect solution in your opinion?**

**[EN]:** When I was a teenager, no one believed in open source or the domains that I was buying and my vision. Today, over 78 percent of the entire Internet and technology revolves around open source. In short, actions have proven louder than words. I have supported open source 100 percent since I was a teenager, and that tenacity has evolved full throttle, which brings us to where we are today. Of course, nothing is perfect, but open source is pretty dang close.

**[BSDMag]: What storage solutions can you recommend?**

**[EN]:** My answer to this question is very broad, as each customer and application I come across represents a different need. As a result, the products and solutions I recommend always reflect the customer's needs and ultimate goals. However, in general, I make my principal suggestions based on open source solutions.

**[BSDMag]: Which open source software supports OSS products? Why those?**

**[EN]:** We use commodity hardware for all of our deployments and stand 100 percent behind everything we create. We also give our clients the source code so they can support, or make any changes to their specific product as desired. Our name truly designates who we are — open, with no vendor lock-in — and that goes for our software as well.

**[BSDMag]: What do you think about using open source systems? What is their advantage other than being free?**

**[EN]:** As the creator of OSS, I can safely say that the advantage to open source has always been 50 percent more cost-efficient to produce, 50 percent faster to develop and 75 percent cheaper to maintain and support than proprietary software. Another outstanding advantage to open source is that it enables developers to build new and disruptive technologies at a fraction of the cost, compared to large enterprise companies.

**[BSDMag]: What about influence from community? How big is their contribution in creating an open source systems?**

**[EN]:** Currently, there are a vast number of libraries of open source code available around the world, which are constantly being used and updated by individuals and enterprise companies; so the community is huge, and its level and quality of contribution is what's driving the current enterprise adoption of open source. Stand by as my next great vision is about to be revealed ...

**[BSDMag]: Do you have any philosophy behind your company? Any mission or core values?**

**[EN]:** The philosophy and core values behind OSS are to create a global shift that will allow every young entrepreneur who wants to create a new technology, or has a great idea, to do so without being forced into a vendor lock-in that only profits the proprietary systems and software.

I believe that freedom and an open mind matter, and that by incorporating everyone in the tech community we can create a global industry capable of unlocking one another's creativity and supporting a shift in technological evolution around the world.

**[BSDMag]: Now tell us something about Eren Niazi Technology for Charities. What do you do there and who is the target audience?**

**[EN]:** My charity organization has been around for over 13 years — but it's not your typical charity in terms of simply donating money. My idea of a charity involves donating

custom, open source software solutions to set recipients free from having to depend on large companies that require expanding IT support budgets — allowing them to move forward with their innovation rather than getting bogged down.

**[BSDMag]: That sounds very generous. Do you think that there should be more charity organizations like yours?**

**[EN]:** As a longtime proponent of open source, yes I do think more charities should focus on giving back in non-monetary ways — especially in the tech community where knowledge and revolutionary building blocks are power.

**[BSDMag]: How does that work? Do you take requests for donations, or do you just find a project you want to support and surprise them?**

**[EN]:** Great question! We do not take any donations of any kind. As an evangelist, I just find projects that I want to support, and then I surprise them.

**[BSDMag]: Are there any challenges OSS is facing at the moment?**

**[EN]:** Right now we are creating a paradigm shift to unlock technology further and disrupt the large corporations that don't allow entrepreneurs to thrive by hiding them behind a big name. We are actively expanding our team and creating disruptive technologies. We are determined to fill our staff with the absolute best and brightest employees. We are creating an aggressive chain of command with unparalleled leadership that is fully committed to my vision toward the global unstoppable open source movement.



**[BSDMag]: Any plans for the future?**

**[EN]:** OSS is currently undergoing a major expansion. We are excited about the future of the company and see a lot of opportunity for growth. We will be sure to update you as our story continues to unfold.[]

**BSDMag]:** Is there is anything you would like to tell our readers? Any piece of advice?

**[EN]:** Never give up on your dreams. Legends are often made of comeback stories and people who never gave up their dreams. So strive to help one another achieve success — no matter the setback. Most of all, be humble, be kind and live free.

## About Eren Niazi:

CEO/Founder, Open Source Storage



At 15-years-old, Eren Niazi had a vision for a world that was free and allowed all programmers to work together as a community to unlock technology. He knew that in utilizing his vision and technology, in conjunction with commodity hardware, he could provide a low-cost scalable enterprise solution. Niazi understood that this would not only create an environment free for programmers to design technology, but would also give them the ability to share it with others. He concluded that with this open community, a natural evolution would occur, making source codes better and allowing young entrepreneurs to pursue their dreams freed from proprietary technology.

Niazi is the original pioneer of the open source storage movement. Today, 78 percent of the Internet runs on open source, which is three times faster, 50 percent cheaper and 75 percent more cost-effective to support. The technologies that Niazi developed in the early- to mid-2000s became the model for data storage solutions today.

His company, Open Source Storage, allows startups and young entrepreneurs to create new technology at a fraction of the cost and encourages the creation of new innovative technology.

Niazi designed Facebook's core systems during its hyper-growth phase from 2004 - 2007 and was instrumental in supporting Friendster, the Web's first social media platform. He also developed technology for the U.S. Army, NASA, Lockheed Martin and Shutterfly.

Eren holds several U.S. patents for disruptive technologies, including 1U and 2U servers as well as a cable management solution and is deeply involved in various software, hardware, green tech and agriculture technologies. He also leads the non-profit “Technology for Charity,” which brings together Information Technology (IT) experts who donate their time and experience to support charities and organizations in need.



- Company website, <http://www.opensourcestorage.com/>
- LinkedIn, <https://www.linkedin.com/company/open-source-storage>
- Twitter, <https://twitter.com/opensourcestor>
- Facebook, <https://www.facebook.com/opensourcestorage/>

*Eren in Facebook data center, where he installed 1200 systems.*



*New Open source Storage Headquarter in Silicon Valley.*



## Quality is a matter of solving the specific customer problem

*Bo Møller from HTML24*



*by Marta Ziemianowicz, Marta Strzelec & Marta Sienicka*

**[BSD Magazine]:** Hello Bo, how have you been doing? Can you please tell us something about yourself?

**[Bo Møller]:** I'm 29 years old. Founder of HTML24 and Mango Apps. Love traveling, mountain climbing and everything where it's possible to compete against yourself or others. I'm a problem solver by trade and I love results. Catch me on Twitter or Instagram. I'm BoMoellerDK in both places.

**[BSD Mag]:** Can you tell us something about your company HTML24?

**[BM]:** HTML24 is a Danish Software and Web development company. We like to say that we're on a quest for results. The quest part meaning that we love taking on big adventures and difficult tasks. Results as in optimizing businesses, delivering great code and solving whatever problem our customers might have. We see ourselves as keen explorers of the vast digital landscape and the opportunities herein.

**[BSD Mag]:** Can you share some of these difficult tasks with our readers?

**[BM]:** Just recently we built a game engine for a customer, where kids can play around on a

projected "monitor" on the floor. A kinect and a projector is then pointed vertically above the floor on which the children can play various movement-enabled games such as a simple version of football. We've also built our own platform for integrating all kinds of business critical systems. The platform handles exchanging data between e.g. ERP-systems (SAP, Nav, Ax) and CMS-platforms such as Umbraco, WordPress, Magento and similar.

**[BSD Mag]:** You are using open source software. Which one and why?

**[BM]:** We love open source. We work primarily with PHP and Symfony when developing software. We've done several hundred websites in WordPress and our systems are most often build on something running PHP.

**[BSD Mag]:** Why PHP and Symfony?

**[BM]:** PHP is great because it's easy to find developers, the community is huge and it's easy to work with PHP based server setups. Symfony because our Lead Developers liked the framework after having looked into Laravel, Zend and a few other frameworks. In reality, I really believe the other frameworks are really good as well. It's just a matter of selecting one and sticking to it.

**[BSD Mag]:** What do you think about open source software? What are the advantages of using it, except of being free?

**[BM]:** Transparency, great community.

**[BSD Mag]:** Great community? How can community influence the quality of open source software?

**[BM]:** I haven't really focused on that. Quality to me is a matter of solving the specific customer problem. This can be done through various systems and programming languages. When working with a language such as PHP it is, however, very easy to be productive and do great work as there are a bunch of great people contributing publicly with solutions to already existing problems.

**[BSD Mag]:** But only 1 Linux User in the office? ;)

**[BM]:** If you found that number on our website then I have to admit that we haven't been really good at keeping it updated. I believe we have quite a few more people running Linux.

**[BSD Mag]:** Do your customers care about the programming and software part or do they want the products to work properly? Has anybody ever asked, why the price is high, if the product is "cheap"?

**[BM]:** We deliver results, not tools. This really means that our customers rarely have any thoughts on the tools we use, as we're really just delivering the results they are looking for.

**[BSD Mag]:** Are you a part of open source community? Have you been working for

open source community or are you a business guy, so it's not your thing?

**[BM]:** I work as the director and head of strategy at HTML24, which means I don't get to do any actual coding. We have several employees who have contributed in various open source projects, however. Actually, we have also open sourced various projects of our own. We have a great system for managing foosball leagues (table football) which we open sourced recently.

**[BSD Mag]:** You are also a Co-Founder of Mango Apps. What is it?

**[BM]:** Mango Apps is the name of the company running and developing Europe's fastest growing administration platform for therapists, [www.easypractice.net](http://www.easypractice.net). We're live in 10 European countries handling administration, journals, bookings and invoicing for more than 5.000 therapists.

**[BSD Mag]:** A platform for therapists? That's unusual, why did you decide to create this platform?

**[BM]:** My partner in the company and I really share a passion for great business and optimization. We figured we would like to try and work in an industry where we could apply our knowledge of business process optimization, great customer experiences and digital systems. My partner in the company, Emil, analyzed various markets and decided that administration platforms for therapists was a great and untried blue ocean for us.



**[BSD Mag]:** How is Copenhagen? Do you think a small country like Denmark is a good market for such business? Wouldn't it be easier in USA or UK?

**[BM]:** HTML24 has historically delivered great financial results every year so it's hard to be very pessimistic about Copenhagen or the company itself. Personally, I love Copenhagen. It's a great place to live and there are a lot of great get togethers for tech people.

**[BSD Mag]:** Do you have any philosophy behind your company? Any story?

**[BM]:** We believe in taking on quests for results. That's our core belief and that's how we code and do business. Challenge us.

**[BSD Mag]:** Aren't you afraid that taking too many quests will lead to making poor results?

**[BM]:** On the contrary. Our key competence is problem solving. Questing if you will. Some say that a smooth sea never made a skilled sailor. I think that's a great way of putting it.

**[BSD Mag]:** Are there any challenges html24.dk has to face at the moment?

**[BM]:** We have plenty of challenges all the time.

**[BSD Mag]:** What's the biggest one right now?

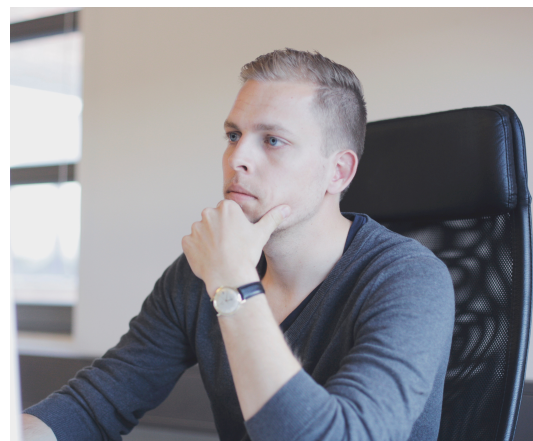
**[BM]:** We don't really rate our projects based on the challenge. We try to focus on just moving along and handling whatever happens on the way.

**[BSD Mag]:** Any plans for the future?

**[BM]:** We're going to continue growing in Copenhagen and Denmark, while focusing even more on open source platforms.

**[BSD Mag]:** Any advice for our readers? (especially from the young entrepreneur perspective?)

**[BM]:** As far as entrepreneurial advice goes, I must admit I'm pretty narrow minded. I believe in working hard. Ideas don't matter. Hard work, sales and great colleagues do.



## About Bo Møller

Business developer, strategist, investor and fond of all things competitive. Pri-

marily involved in digital businesses.

## Technology Trends in 2016



*by Dr Werner Vogels, CTO of Amazon.com*

**Technology and software is becoming integrated into every aspect of our personal and business lives, and every year this integration gets deeper and deeper. Given the pervasiveness of technology in our lives, it is hard to cover all the trends that are impacting us but in this article, I will focus on a few that we are seeing have an immediate effect on our customers around the world and what we can expect to see in the coming year. These trends are focused on simplification and how it is becoming easier for businesses to build highly effective applications that are secure and reliable and deliver great scalability and performance at the lowest possible cost.**

### **Making application building simpler**

Despite the promise of technology simplifying our lives, over time, some applications have become rather complex. This is despite the visionary work by systems researcher John Gall who wrote decades ago that, 'applications built as a complex system almost never work.' Complex systems that do work are invariably constructed as simple systems at first and

then extended over time to include more complexity. It is easier to build a simple system that is secure and reliable and extend it than start with a complex system where there are too many variations to control. As this is the case, we are seeing a big trend emerge where people are seeking to simplify their applications, infrastructures and technological systems. In 2016, we can expect to see the quest for building simpler systems to take off.



The reason for this is customers can get their hands on number of new components delivered as cloud services:

## **Simplifying Service Creation: Microservices**

In traditional service oriented architectures, services are often rather course-grained. For example, a customer management service may hold all functionality related to operations on customer data. However, many of the functions of this service do not overlap in terms of scalability and availability. A customer login function, which is accessed frequently, has radically different scaling requirements than a customer address book service which is only needed when shipping products. To simplify these types of monolithic systems, we are seeing a trend emerge where applications are being broken down into their component parts.

Deconstructing services and software systems into the smallest building blocks possible is a trend that is becoming hot in software development. The small services are often dubbed microservices and are supported by management components, such as those delivered by Docker. This makes applications more flexible and also changes the software development process. Patching the larger systems with software updates is no longer needed but instead delivering a new version of the microservice to replace the previous version is what is required.

Cloud computing providers are delivering container management environments that make it easy to create and manage microservices environments, triggering an acceleration of this architectural trend. In 2016, and beyond, we

can expect this to become standard practice for all new applications.

## **Simplifying Compute: Serverless Architectures**

One of the biggest revolutions we have seen in the technology world in the last few years is the rise of serverless computing. This has been largely triggered by the launch of AWS Lambda that no longer requires a server (physical or virtual) to run application code. This tremendously simplifies application development as architects only need to think about business logic and no longer need to worry about managing fleets of servers to run their software. This makes it easier to achieve the security and reliability to protect their business and their customers. After all, no server is easier to manage than no server.

We are already seeing complete businesses being built that don't use a single server. A good example is Teletext.io. This is a Dutch start-up that has come up with an innovative Content Management System technology that allows the text of webpages to be managed and deployed by the writer of the text, rather than the programmer. Taking a serverless approach allows Teletext to quickly and easily launch a service that is helpful to businesses all over the world and also gives them a scalable solution with an almost infinite peak capacity.

Teletext.io is just one example of the many organizations we are seeing build their applications and businesses without any servers. I think this trend is going to explode in 2016.

## **Simplifying Integration: APIs for everything**

The days where systems were built out of software pieces that were under total control of the developer are long gone. Modern development is a matter of connecting many different services together, some from cloud providers, such as managed databases or analytics services, others from the 3rd party cloud ecosystem, such as Stripe for mobile payments or Twilio for telephony services. To be able to connect and consume these services, they need to have an Application Programming Interface or API.

The great thing about APIs is they can be consumed internally as well as externally. We see not only new software getting APIs but also legacy software components, like the system-of-records being wrapped with APIs such that new product innovations can access the legacy systems. Unique functionality can also be made available to partners or customers to consume these services, creating new collaboration and revenue models.

A good example is The Guardian newspaper in the UK. The Guardian, through their API served on AWS, has created a platform for constructing applications that have access to the company's award winning journalism – giving access to over 1.7 million pieces of content dating back to 1999. The cloud is an ideal platform for building APIs, as it allows you to deal with API traffic in a scalable, low cost manner, while most of your partners are likely to run in the same cloud and experience very low latencies to your functionality and data.

APIs are giving organizations of all sizes the ability to create entire ecosystems of development that is allowing their core business to grow into unexpected directions. This is bringing their data and functionality in front of many more users, and creating partners who are passionate about helping them improve their service. Into 2016 and beyond, we expect every customer facing service in all companies to have its own API and I for one am excited to see the innovation that results.

## **Simplifying security: Cloud security becomes the best way to protect your business and customers**

Looking to the future, and specifically into 2016, I truly believe we will see a general acceptance that 'organisations are more secure in the cloud than in their own data centres.' We are already starting to see this happen where enterprises are migrating their critical business processes to the cloud to get immediate benefits from the latest innovations in operational security and the fine-grain security tools to protect their individual applications. By offloading the management and improvement of the infrastructure security to a cloud provider, it is simplifying security for organizations of all sizes.

Surprisingly for some, one of the first places we have seen this trend has come from the financial services space. At the AWS re:Invent customer conference, Rob Alexander, Chief Information Officer for banking and credit card giant Capital One said, "The financial service industry attracts some of the worst cyber criminals.



We work closely with AWS to develop a security model, which we believe enables us to operate more securely in the public cloud than we can in our own data centers." As a result, Capital One is now using AWS to reduce its data centers from eight to three by 2018 and the bank is using or experimenting with nearly every AWS service to develop, test, build, and run its most critical workloads, including its new flagship mobile-banking application. As more organizations in security conscious industries, such as financial services, utilities, transport and the public sector, move to the cloud, I believe 2016 will be the year that the cloud becomes mainstream and is accepted as the place to store your content if you want to keep it safe and strengthen and simplify your security.

## It is still Day One

With 2016 just around the corner, I am only scratching the surface of what is possible and what we will see appear in technology in the coming year. With the rise of simplification, we will continue to see more trends emerge, Simplifying Predictions, Simplifying Connected Devices, Simplifying Real Time and many, many more ways that technology will continue to become more ingrained in our day to day lives and change how we live and how we interact with the world around us.

### Editors' Note

Article has been provided by



## To SLOG or not to SLOG: How to best configure your ZFS Intent Log

*by Mark VonFange*



**In the world of storage, caching can play a big role in improving performance. OpenZFS offers some very powerful tools to improve read & write performance. To improve read performance, ZFS utilizes system memory as an Adaptive Replacement Cache (ARC), which stores your file system's most frequently and recently used data in your system memory. You can then add a Level 2 Adaptive Replacement Cache (L2ARC) to extend the ARC to a dedicated disk (or disks) to dramatically improve read speeds, effectively giving the user all-flash performance**

OpenZFS also includes something called the ZFS Intent Log (ZIL). The ZIL can be set up on a dedicated disk called a Separate Intent Log (SLOG) similar to the L2ARC, but it is not simply a performance boosting technology. This article aims to provide the information needed to understand what the ZIL does and how it works to help you determine when SLOG will help and how to optimize write performance in general.

### **Isn't the ZIL just ZFS's name for a write cache?**

Many people think of the ZFS Intent Log like they would your standard, run of the mill write

cache. This causes some confusion in understanding how it works and how to best configure it. First of all, the ZIL is more accurately referred to as a "log" whose main purpose is actually for data integrity. It exists to keep track of in-progress, synchronous write operations so they can be completed or rolled back after a system crash or power failure. Standard caching generally utilizes system memory and data is lost in those scenarios. The ZIL prevents that.

Second, the ZIL does not handle asynchronous writes by default.



Those simply go through system memory like they would on any standard caching system. This means that the ZIL only works out of the box in select use cases, like database storage or virtualization over NFS. OpenZFS does allow a workaround if you decide to opt for the extra level of data integrity in your asynchronous writes, by switching from

```
"sync=standard"
```

to

```
"sync=always"
```

mode, but that must be manually configured.

Third, the ZIL, in and of itself, does not improve performance. The ZIL sits in your existing data pool by default, usually comprised of spinning disks, to log synchronous writes before being periodically flushed to their final location in storage. This means that your synchronous writes are not only operating at the speed of your storage pool, but have to be written to pool twice, sometimes more, depending on your level of disk redundancy.

### How should you configure your ZIL?

As stated above, the ZIL's primary purpose is to protect data in the case of a system crash or power failure and comes with performance penalties because it must be written to the ZIL before making it to your storage pool. What is needed for performance improvement is a dedicated SLOG, like a low-latency SSD or other similar device (ZeusRAM, etc), so your ZIL-based writes will not be limited by your pool IOPS or subject to RAID penalties you face with additional parity disk writes. And even with a dedicated SLOG, you will not enjoy per-

formance improvements out of the box on asynchronous writes, as they do not utilize the ZIL by default.

To optimize your ZIL performance, the following things should be considered:

- Use case: If your use case involves synchronous writes, utilizing a SLOG for your ZIL will provide benefit. Database applications or NFS environments, particularly for virtualization, are known use cases with heavy synchronous writes.
- Storage pool protection (RAID): When your ZIL is in-pool, you run a standard performance overhead of 2 writes + your write penalty for your RAID configuration, which comes to four writes total per transaction with RAID-Z1, six with RAID-Z2, and eight with RAID-Z3. RAID-10 provides no additional performance penalty over raw disks. When redundancy is added, you will have additional penalties (an additional write to the ZIL per parity drive). You will have four writes total per transaction with RAID-Z1, six with RAID-Z2, and eight with RAID-Z3. RAID-10 provides no additional performance penalty over raw disks.
- "sync=standard" vs. "sync=always": Asynchronous writes are not protected by the ZIL in the default "sync=standard" configuration under OpenZFS. If losing the couple seconds worth of write data in a power loss or system crash would be harmful to your operations, setting ZFS to "sync=always" will force all writes through the ZIL. This will make all your writes perform at the speed of the device your ZIL is set to, so you will want a dedicated SLOG under this configuration or writes will be painfully slow.

- Choosing a SLOG device: OpenZFS aggregates your writes into “transaction groups” which are flushed to their final location periodically (every five seconds in FreeNAS & TrueNAS). This means that your SLOG device only needs to be able to store as much data as your system throughput can provide over those five seconds. Under a 1GB connection, this would be about .625GB. Correspondingly a 10GB connection would require 6.25GB and 4x10GB would require 25GB. This means latency, rather than size is your main consideration in choosing a device.
- Performance requirements: If you have a use case that utilizes the ZIL, purchasing a dedicated SLOG device is a good way to improve performance. OpenZFS allows for the SLOG to be mirrored, which can improve

your ZIL performance compared to a single SLOG. This means you can scale up your ZIL performance to handle high storage volumes at a relatively low cost.

## Conclusion

OpenZFS provides powerful tools to give your FreeNAS and TrueNAS storage blazing performance with the cost of spinning disk storage. It allows you to add multiple levels of protection and disk redundancy to keep your data safe from corruption and loss. The ZFS Intent Log, or ZIL, is frequently discussed in vague terms that don't provide a full picture of the benefits it provides or how to implement it properly. With the above information, you will have a better idea of how to get maximum performance with write protection for your storage environment.

### Additional ZIL Related Resources

ZFS:

[https://blogs.oracle.com/realneel/entry/the\\_zfs\\_intent\\_log](https://blogs.oracle.com/realneel/entry/the_zfs_intent_log)

<http://blog.delphix.com/ahl/2012/zfs-fundamentals-transaction-groups/>

<http://www.freenas.org/whats-new/2015/11/zfs-zil-and-slog-demystified.html>

<https://www.ixsystems.com/whats-new/2015/02/04/why-zil-size-matters-or-doesnt/>

## Editors' Note

Article provided by



### Choosing a SLOG device:

<http://www.tomshardware.com/reviews/ssd-recommendation-benchmark,3269.html>

<http://ssd.userbenchmark.com/Explore/Fastest-SSD/8>

<http://ssds.specout.com/>

<http://www.ssdreview.com/?page=1>



## FreeBSD and FreeNAS in Business

*by Randy Westlund*

**My father owns Charlotte Tent & Awning, a small business with about 30 employees, selling canvas and metal awnings to a wide variety of customers, from homeowners to massive shopping centers and sports stadiums. I'm going to tell you how FreeBSD and FreeNAS came to play a critical role in his business.**

### Background

In the awning business, every awning must be custom-made to the dimensions of the building where it will be installed. There are also fabric and logo choices by customers that must be exactly right.

When contacted by a customer, the first step is for a salesman to visit their home, show fabric samples, and take measurements. If the customer decides to make the purchase, the work order is submitted by the salesman to the fabrication department, which welds together a frame, sews the fabric, and staples them together.

Once fabrication is complete, the installation department schedules a time to bring the awning to the customer's home and install it.

The whole process takes about four weeks, which means there are many active orders at

any time. To complicate matters, there are sometimes modifications to an order partway through fabrication, times when they must wait for another company to ship them special fabric or parts, and special paperwork to handle for commercial or out-of-state jobs.

Keeping track of all ongoing jobs and making sure everyone has the most up to date information can quickly become a logistical nightmare. Any mistakes or miscommunications are very costly.

### The Old Way

They used to manage most of this on paper. Photocopies of hand-written orders were distributed to everyone's physical mailbox, and any questions had to be run through the salesman responsible for the job. Outdated copies of orders were a problem, and the salesmen spent a lot of time coordinating.

Quickbooks handled billing. For photos of completed jobs, spreadsheets of all current jobs, and general status management, they used Dropbox and Microsoft Excel. This came with a number of problems:

- There were frequent conflicts when someone forgot to save their changes.
- Whenever someone added a photo to the company Dropbox account, it was uploaded to Dropbox, then downloaded 15 times in parallel to the other computers in the office, which caused bandwidth problems.
- It was difficult to keep the information in Dropbox and on the printed work orders consistent.
- Customer and job information had to be entered in multiple locations.

Complicating the internet situation was the fact that their consumer-grade router would reboot several times a day for no discernible reason.

## Looking for Solutions

This is when my dad asked me for suggestions. He said that as they'd been growing, this had become less manageable. They needed something new.

At first, I looked at off-the-shelf solutions. I found a number of cloud services that were like Dropbox, but with some generic management stuff layered on top. Not only did these all feel like a poor solution, they were very expensive. If the provider were to go out of business, what would happen to my dad's company?

Being an engineer, I got frustrated with trying to put a square peg in a round hole and decided to write a system myself.

## The Right Solution

I went through several iterations and had frequent meetings with the management staff, but we finally nailed down exactly what was needed.

I defined data models for customers, awnings, and jobs, and wrote a RESTful API with Nodejs, Express, and MongoDB (I now regret not using PostgreSQL, but that's a story for a different time).

I wrote the client-side app in Angularjs, with Bootstrap CSS and a mobile-first design. I plugged in Google OAuth so I didn't have to manage passwords, and gave each employee an account with varying permissions (e.g. an installer can't see any financial data).

## The End Result

So what does it look like now?

- All employees can view the status of all jobs, right from their phone, even when they're on the road; no more calling the salesman with every little question.
- Every department can update a job with their status; no more situations where two people were both waiting on each other.
- Job records are always up to date, because they're all stored in the same database.
- Every job has a version number, so it's easy to follow the most recent information.



- Customer information only has to be input once; no more handwriting.
- Salesman can auto-generate PDF forms; no more misreading sloppy handwriting and no more time wasted photocopying handwritten notes.
- The server does price and tax calculations automatically.
- There's no dependence on some other company to stay in business.
- Viewing the data on a phone integrates with Google Maps; no more printing out directions.

## The Infrastructure

Fortunately, sourcing the hardware and setting up the OS was the easiest part; I talked to iXsystems. I ordered a FreeNAS Mini and a nice workstation tower, which were less than \$4k, including hard drives and OS setup.

I had to fly to Charlotte to install the servers, so I scheduled a few days to make sure I could install everything and train the employees on the system I'd created.

The servers were waiting for me when I arrived, and I got to work. Unboxing stuff from iX is very nice. Everything was super padded, the hard drives were already screwed into the trays, and the trays were labeled. I literally just had to slide the drives in and power the servers up. The OS was already installed and the drives were ready with the ZFS configuration I requested.

I installed my database/web software on the tower server (r2d2, because it does the number crunching) and added shares for office personnel on the FreeNAS Mini (c3po, because of Samba shares and human interaction). And yes, I realize I named the tall skinny one r2d2 :P

I have r2d2 replicating ZFS snapshots to c3po, and the data is backed up off-site regularly. This data is absolutely mission-critical, so I can't take any risks. I'm glad I have ZFS on my side.

I replaced Dropbox with Samba on c3po, and the Windows machines in the office now store important data on the NAS, rather than their local drives.

I also replaced their router with an APU board running pfSense and replaced their PPTP VPN with OpenVPN and certificate authorization. Then upgraded the ancient 100 Mbit switch with a 1 Gbit model.

Because the server setup was already done for me, I finished with an entire day to spare.

Shortly thereafter, I recreated their company website with a mobile-friendly design, hosted in another jail on r2d2.

## Looking Back

This setup has been in place for several months, and everyone is delighted with it. There are no more networking problems, fewer miscommunications, and much less time spent coordinating work. Efficiency is way up.

FreeBSD (in three different incarnations) helped me focus on improving the company's workflow without spending much time on the

OS. And now there's an awning company that is, in a very real sense, powered by FreeBSD.



## About the Author:

I'm an engineer and open source advocate living near Cambridge, MA. I do a lot of freelance work and work from home most days.

My areas of focus include electronics, PCB design, microcontrollers, robotics, Linux, BSD, system administration, web design, and RF communications. I've been to Antarctica twice, doing satellite communication work for NASA.

I'm a licensed amateur radio operator, callsign KK4DOP.

In my spare time, I enjoy hiking, photography, and running BSD servers on computers other people throw away.

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## FreeNAS Home Server Build

*by John Ramsden*

**I've spent the last couple months configuring and setting up a new home server, with the intent of using it as a storage and media server.**

I looked at a few different options for the operating system I wanted to run. I knew I wanted to use an OS with support for an advanced file-system with features like snapshots and check-summing for data integrity. It's going to be used as a storage server so I wanted a file system that wasn't going to corrupt my data. I also knew I was going to be working with at least four discs to start, maybe more, so I wanted a file system that was able to deal with multiple drives and a large storage pool. This really didn't leave me with too many choices and I settled on using a variant of [FreeBSD](<https://www.freebsd.org>) with ZFS. I considered using a Linux distribution with ZFS as that's what I'm more comfortable with, but largely due to the amount of user adoption on FreeBSD, the amount that ZFS has been tested on Linux comes nowhere close to how much it's been tested on FreeBSD. In addition to that, at the time of this build, no Linux distribution ships with ZFS support natively, hopefully this changes soon.

I considered using plain FreeBSD to give myself complete flexibility, but given that this was my first server build and I was basically intending to use the server for network attached storage, I settled on using [FreeNAS](<http://www.freenas.org>) for the ease of use and advanced features. FreeNAS is a variant of FreeBSD that has been altered in order to be an easy to use network attached storage server. It can all be managed from a web interface and is easy to use but is also filled with power features. Since it's also essentially FreeBSD under the hood, if you do want to accomplish something that can't be done in the web interface, you can easily drop down into the command line. The web interface makes it easy to manage your ZFS volumes and discs, letting you attach new pools or export your pools, take snapshots, make datasets, and use ZFS replication. I figured this would be an easy way to get used to using all these features and that if I wanted to switch to FreeBSD at a later date, it would be as easy as exporting my pool and installing FreeBSD.



## Hardware Requirements

On the [FreeNAS website] (<http://www.freenas.org/hardware-requirements/>) the minimum hardware requirements are listed as:

- Multicore 64-bit processor (Recommended Intel)
- 8GB boot drive
- 8GB of RAM
- A physical network port

And the recommended hardware is listed as:

- Multicore 64-bit processor (Recommended Intel)
- 16GB boot drive
- 16GB of ECC RAM
- Two directly attached discs (non-hardware RAID)
- A physical network port

One thing that might stick out here is that hardware RAID is not recommended. This is because ZFS uses software RAID, and thus if you use a hardware RAID controller, there is an extra layer in between ZFS and the discs. This can hide things from ZFS and cause problems, so a host bus adapter (HBA) is recommended for use instead of a RAID controller.

The other thing is Error Correcting Code memory (ECC). There has been a lot of talk about whether or not it's necessary to use ECC RAM, but ultimately the consensus is if you

care about data integrity on your server, you should have it. This is especially true on a server intended for storage. ECC RAM is able to detect and correct data corruption in memory. This is necessary even with ZFS having advanced error checking capabilities. While ZFS is able to check to make sure your data remains in the same state in which it was written, it has no way of verifying the quality of that data. When incorrect data (say in the form of a flipped bit) gets read from memory, ZFS has no way of knowing that the data is corrupted and will still write it to the disk. ECC RAM, on the other hand, will correct the most common types of data corruption.

What made the hardware in my build atypical from the average server build is the requirements of ZFS. In order to work correctly, ZFS requires a lot of memory, as it uses an intelligent caching system called the “adaptive replacement cache” that allows it to make good use of whatever memory you give it. If you do not have enough memory, all sorts of strange things can start happening on your system. It is therefore not recommended to run FreeNAS with any less than 8 GB of memory, and for every terabyte of storage on your server, an additional gigabyte of memory should be added. It makes sense to start with a minimum of around 16GB of memory on most home sized server builds.

## Build

**Figure 1. FreeNAS build parts.**

The parts I ended up deciding on for my build were probably a bit overkill for my needs, but I wanted to build something that I knew would last for a while

and would work

for anything I wanted to throw at it.

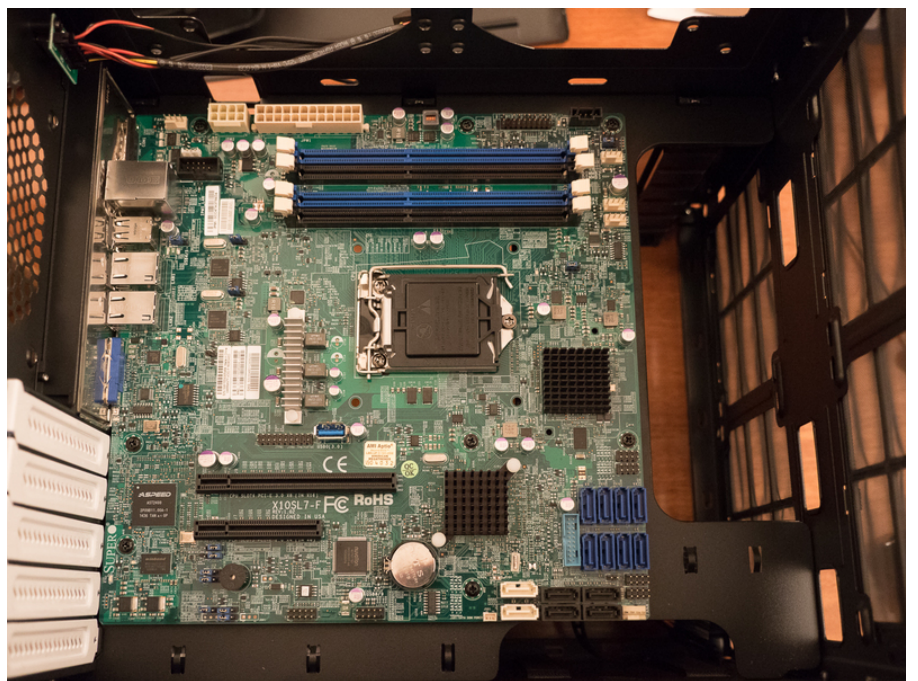
My requirements were something that would be small enough to sit by my desk, was quiet, and drew fairly little power. I also wanted it to be expandable and have fault-tolerance so that I could lose several drives and not lose my data. These requirements were what ended up bringing me to my choice of hardware.

## Parts

- Fractal Design Node 804 Chassis
- Supermicro X10SL7-F Motherboard
- Xeon E3-1231 v3 CPU
- 4x Samsung DDR3 1.35v-1600 M391B1G73QH0 RAM
- 2x 32GB SATA III SMC DOM Boot Drive
- SeaSonic G-550 Power Supply

- Cyberpower CP1500PFCLCD 1500VA 900W PFC UPS
- 6x Western Digital 6TB Red HDD
- 2 x ENERMAX T.B. Silence UCTB12P Case Fan
- 3x Noctua NF-P14s redux-1200 Case Fan

## Supermicro X10SL7-F Motherboard



**Figure 2. Supermicro X10SL7-F Motherboard.**

Initially, when I started the build, I was looking at mini-ITX motherboards. With a mini-ITX, you can get a smaller case, as well as possibly lower power consumption. In particular, I was impressed with the feature set on the [AS-Rock 2550D4I] (<http://www.asrockrack.com/general/productdetail.asp?Model=C2550D4I#Specifications>). However, the small cases that a mini-ITX permits can actually be an issue.



When you cram all of your hard drives in an extremely small space where you have impeded air flow, you're more likely to start having heat problems. It probably wasn't the best idea to get a tiny case, cram a bunch of hard drives together and expect a quiet and cool box. In addition, the kind of power you're going to get out of the Atom processor that is on the ASRock is not even close to what you would get out of a Xeon.

Upon doing a bit more reading, and listening to people's recommendations on the FreeNAS forums, I came to the conclusion that I'd be better off getting a Supermicro micro ATX motherboard. They are the most highly recommended and compatibility issues are less likely. They're also server grade motherboards, which means they have features you're not going to see in a desktop motherboard. During the build, the one feature that ended up being my favorite was IPMI. It allows you to administer the motherboard remotely, meaning you never have to hook up a monitor and keyboard to turn on and off the server, type commands into the console, and view sensor information.

There are a few options that I looked at from Supermicro, in particular the [X10SLL-F](<http://www.supermicro.com/products/motherboard/Xeon/C220/X10SLL-F.cfm>), [X9SRH-7F](<http://www.supermicro.com/products/motherboard/Xeon/C600/X9SRH-7F.cfm>) and [X10SL7-F](<http://www.supermicro.com/products/motherboard/Xeon/C220/X10SL7-F.cfm>). The X10SLL-F had a max of six discs, and I wasn't sure if that was going to be enough in case I wanted to expand in the future. The X9SRH-7F, on the other hand, is double the

cost of the X10SL7-F and is a bit of overkill for my needs. The X10SL7-F seemed like a good middle ground, as it's half the price of the X9SRH-7F. Seeing as I didn't think I would need any more than 32 gigabytes of RAM, and it includes a LSI SAS 6Gbps controller, it seemed like the best choice.

## Chassis



*Figure 3. Fractal Design Node 804.*

I ended up choosing this chassis as I wanted something a little bit different for my server than just a regular tower case to differentiate it from a desktop. Fractal Node makes really nicely designed cases, and this one in particular has lots of room for airflow on the inside as well as room for up to 10 3.5" drives and two 2.5" drives. I probably could have gotten away with a smaller case if I had gone with the tower, as there is a fair bit of room on the one side where the hard drives aren't stored since I didn't need a graphics card.

## CPU

##### Xeon E3-1231 v3 Seeing as I wanted a CPU that supported ECC memory, had AES-NI and I was planning on using the server as a media server,



I chose to go for the higher end CPU choice of the [Xeon E3-1231 v3]([http://ark.intel.com/products/80910/Intel-Xeon-Processor-E3-1231-v3-8M-Cache-3\\_40-GHz](http://ark.intel.com/products/80910/Intel-Xeon-Processor-E3-1231-v3-8M-Cache-3_40-GHz)). The higher end processor seemed necessary as it was going to be doing some transcoding and I didn't want the server falling to its knees every time someone tried to watch a video. The difference in power consumption between using this compared to a Pentium is fairly negligible so it didn't seem worth it just to save a tiny bit of power.

## Memory

#### Samsung DDR3 1.35v-1600  
M391B1G73QH0 RAM

I ended up maxing out the amount of memory at 32GB that I can put on my motherboard as it only allows 8GB DIMMs. I figured it was worth giving FreeNAS as much memory as it could work with, as ZFS is optimized to make good use of it. Too little memory on FreeNAS and you're likely to start seeing problems.

This was actually the part I had the hardest time finding. Using memory that is not on your motherboard's recommended parts list can lead to some issues, especially with ZFS and FreeNAS, so I had to track down a specific type of memory. There are even [horror stories](<https://forums.freenas.org/index.php?threads/kingston-4-x-8gb-ram-problem.18449/>) on the FreeNAS forums about problems created by using incorrect memory.

## Boot Drive

#### 2x 32GB SATA III SMC DOM

The way FreeNAS runs is quite different than most other systems. While normally your operating system is running right off the drive, FreeNAS puts the entire operating system into memory upon startup. For the longest time, people have been using USB flash-drives as a boot drive because, although slower, it shouldn't matter what the speed of the drive is once the system has booted up. USB flash-drives have also been popular because not much space is needed for the OS, as anything that's installed as a plugin goes right on your hard drive in FreeNAS. The only thing that is written to the disc is the operating system, for security reasons.

On the FreeNAS forums, there's recently been a bit of a shift to using SSDs or [SATA DOMs](<http://www.supermicro.com/products/nfo/SATADOM.cfm>) for reliability. I ended up going with a SATA DOM as they're nice and small, they can be plugged directly into a SATA port, and they have a fairly low power consumption. I could have also just used a small SSD.

I wanted to have a bit of extra redundancy so that in case the boot drive got corrupted, I could easily restore functionality to the server without losing my FreeNAS configuration. While it's probably a little overkill, I decided to run 2 mirrored SATA DOMs as my boot drive. In case one fails, I should be able to just reboot and run straight off the other one. I can then pick up another SATA DOM, plug it in and the mirror will resilver.

Hard Drives

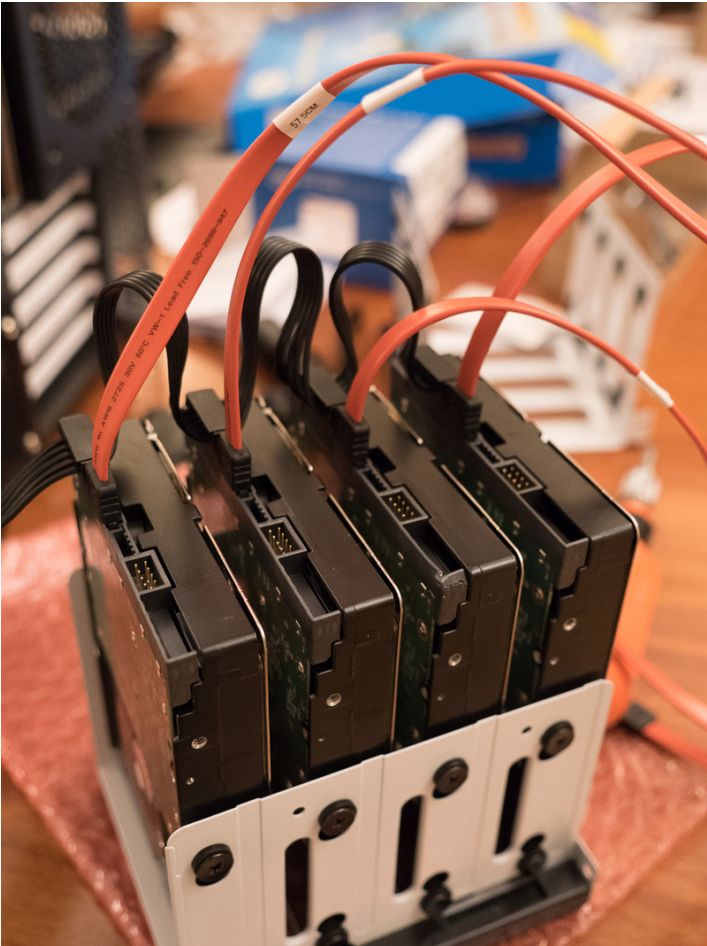


Figure 4. 6x 6TB Western Digital Reds.

The Western Digital reds are kind of the go-to for most high end home servers and are highly recommended

on the FreeNAS forums. I went with the 6TB drives as they seem to be at a pretty good price per gigabyte.



Figure 5. Hard Drives in case.

The six hard drives fit nicely in the case and I could easily fit another three drives in the bay. I also still have room for two SSDs in case I ever decide I want to put in a cache, log, or

L2ARC, which I decided would not be beneficial at this point.

Case Fans

##### ENERMAX T.B. Silence UCTB12P and Noctua NF-P14s redux-1200

Unfortunately, while the case does come with three fairly quiet fans, they have no PWM and therefore need to be stuck on a constant setting. I had planned to put the server right in my workspace and wanted it to be fairly quiet. I also wanted to be sure it was getting adequate cooling and therefore leaving it at a constant setting kind of worried me. I ended up deciding to get PWM fans that will ramp up and down based on the temperature of the CPU. The motherboard has the ability to run five fans using PWM, one of which is reserved for the CPU. With these fans, the server is extremely quiet, even when it gets up to a high workload. I would say it's much quieter than an average desktop PC

FreeNAS Setup

Setting up FreeNAS was incredibly easy. I downloaded the image, and because of IPMI, was able to mount the image over the network as if it was a regular drive.



Figure 6. ipmi mount.



After booting from the image, I saw the following screen with the IP of my FreeNAS box and a few setup options. I didn't need to change anything at this screen, and you can change all of these options later from the web interface.

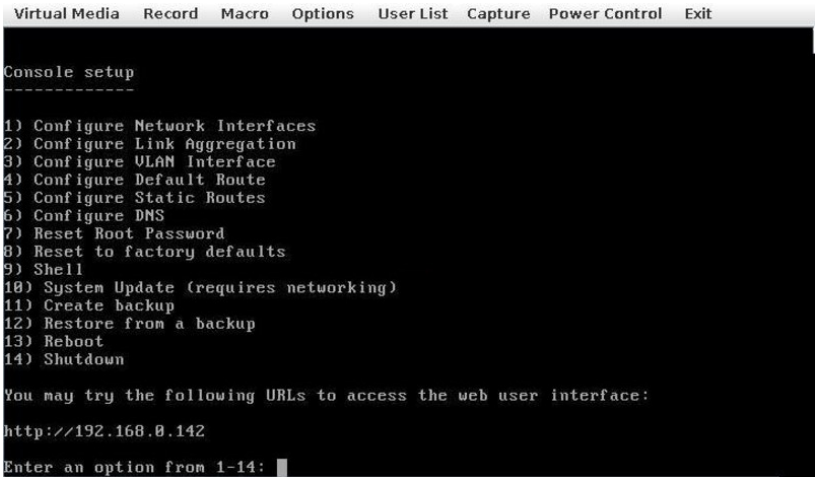


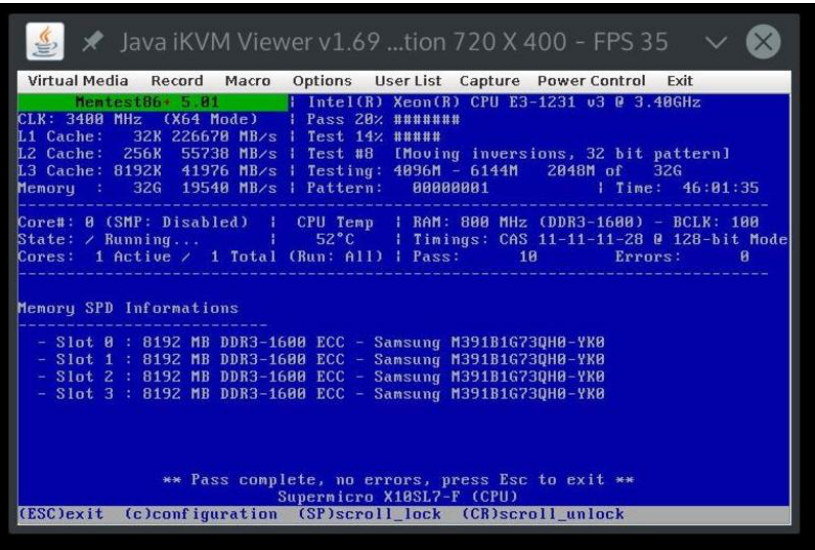
Figure 7. Boot Screen.

After punching in my IP in my browser, I was greeted by FreeNAS's welcome screen and the setup wizard. Before going through with the setup and initializing my discs, I ran a proper burn-in.

Burn in

### Memory

As memory is so key to ZFS, it was the first thing I checked. I downloaded a utility called [memtest86+](http://www.memtest.org/) and let it run for 46 hours.



Hard Drives

Most hard drives die in the first hours of usage, so this makes it all the more critical to run the proper tests before setting up your entire system so that you don't do all that work and end up finding out later that one or more of your hard drives need to be sent back to the manufacturer. I followed the process detailed on the [FreeNAS forums](https://forums.freenas.org/index.php?threads/how-to-hard-drive-burn-in-testing.21451/), which explains how to run a proper burn in on your disks in order to weed out bad hardware.

The process I went through involved:



Figure 8. Memtest86+



2. Badblocks test:

```
* Enable the kernel geometry debug flags

...

sysctl kern.geom.debugflags=0x10

...

* Run badblocks on each drive (4096 block due
to 6TB size):

...

badblocks -b 4096 -ws /dev/adaX

...
```

The badblocks test took me almost four days due to the large hard drives.

3. Rerun smartctl long test:

```
* Long test:

...

smartctl -t long /dev/adaX

...
```

4. View results:

```
...
```

[root@freenas] ~# smartctl -A /dev/da0

smartctl 6.3 2014-07-26 r3976 [FreeBSD 9.3-RELEASE-p28 amd64] (local build)

Copyright (C) 2002-14, Bruce Allen, Christian Franke, [www.smartmontools.org](http://www.smartmontools.org)

=== START OF READ SMART DATA SECTION ===

SMART Attributes Data Structure revision number: 16

Vendor Specific SMART Attributes with Thresholds:

ID#	ATTRIBUTE_NAME	FLAG	VALUE	WORST	THRESH	TYPE	UPDATED	WHEN_FAILED	RAW_VALUE
-----	----------------	------	-------	-------	--------	------	---------	-------------	-----------

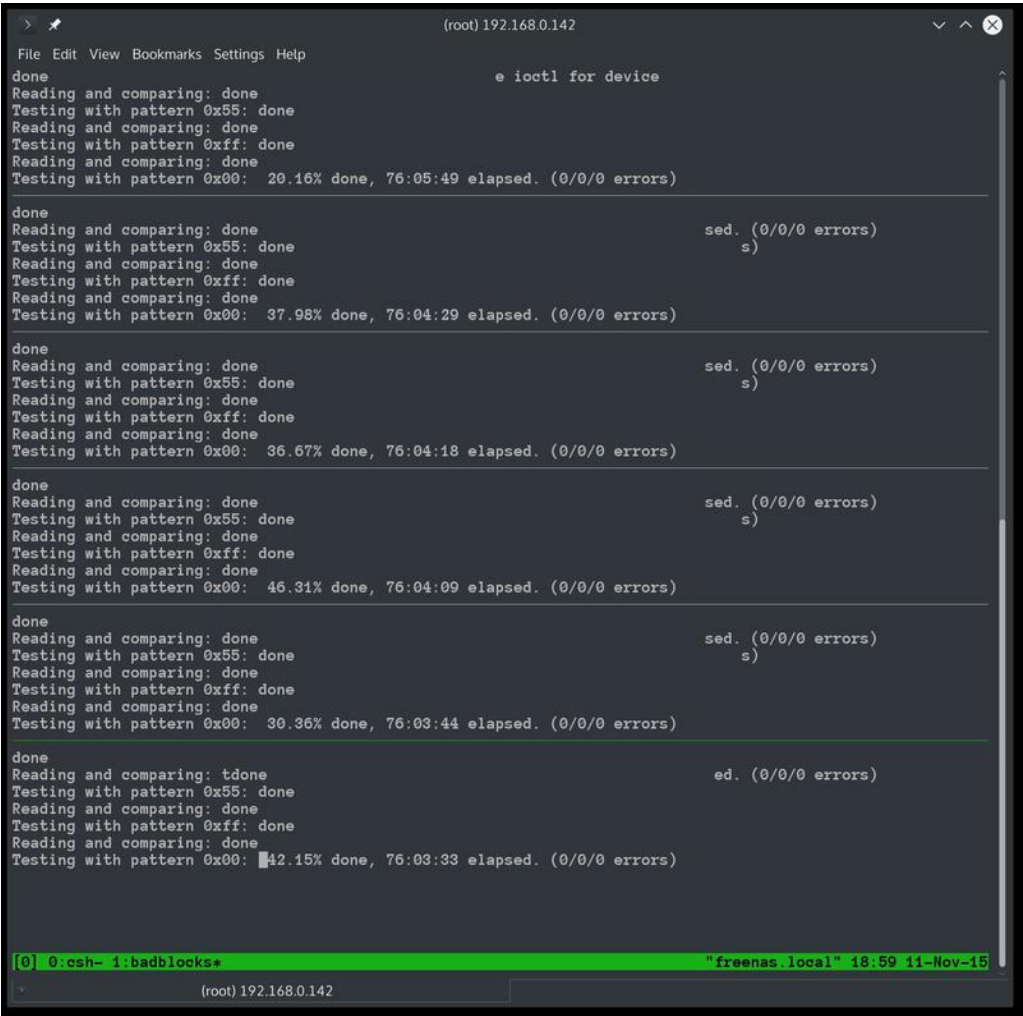


Figure 9. Badblocks.

1	Raw_Read_Error_Rate	0x002f	200
200	051	Pre-fail	Always - 0
3	Spin_Up_Time	0x0027	198
198	021	Pre-fail	Always - 9091
4	Start_Stop_Count	0x0032	100
100	000	Old_age	Always - 22
5	Reallocated_Sector_Ct	0x0033	200
200	140	Pre-fail	Always - 0
7	Seek_Error_Rate	0x002e	200
200	000	Old_age	Always - 0
9	Power_On_Hours	0x0032	100
100	000	Old_age	Always - 166
10	Spin_Retry_Count	0x0032	100
253	000	Old_age	Always - 0
11	Calibration_Retry_Count	0x0032	100
253	000	Old_age	Always - 0
12	Power_Cycle_Count	0x0032	100
100	000	Old_age	Always - 22
192	Power-Off_Retract_Count	0x0032	
200	200	000	Old_age Always - 20
193	Load_Cycle_Count	0x0032	200
200	000	Old_age	Always - 20
194	Temperature_Celsius	0x0022	125
118	000	Old_age	Always - 27
196	Reallocated_Event_Count	0x0032	
200	200	000	Old_age Always - 0
197	Current_Pending_Sector	0x0032	200
200	000	Old_age	Always - 0

198	Offline_Uncorrectable	0x0030	100
253	000	Old_age	Offline - 0
199	UDMA_CRC_Error_Count	0x0032	
200	200	000	Old_age Always - 0
200	Multi_Zone_Error_Rate	0x0008	200
200	000	Old_age	Offline - 0
...			

Luckily all my results came up clean.

Drive Configuration

I had considered a few different configurations but ultimately, I decided it would be nice to have at least two parity drives so I decided RAIDZ2 would be best. I know it is common for a second drive to fail right after the first, as that's when the drives have to start doing a lot of work to recover the pool, so I wanted to have at least a second drive that had to fail before the entire thing went down. The built-in setup wizard made this very easy and actually told me that RAIDZ2 format would be the optimal setup.

Fan Configuration

The way fans are configured is fairly unintuitive, especially if you want to configure something that is not usually used in servers, like slower, quieter fans. Initially, when I hooked up my PWM fans, they were cycling between off and full speed, making a lot of noise. Obviously this is not what I expected. It turns out the lower threshold value of the fans was set way too high for a low speed, quiet fan like the type I was trying to put in. In order to fix this I had to go into the IPMI tools where you can set the sensor

My suggested fan thresholds from the manufacturer:

```
FAN1: CPU

FAN2: 120mm |

FAN3: 120mm | SIDE

FAN4: 140mm |

FANA: 140mm | TOP

-----
----

140mm: Noctua NF-P14s redux-1200

[FAN4, FANA]

Max Speed: 1200 RPM (+-10%)

Min Speed: 400 RPM (+-20%)

Lower Non-Recoverable      : 175
Lower Critical              : 250
Lower Non-Critical         : 320

Upper Non-Critical         : 1200
Upper Critical              : 1320
Upper Non-Recoverable      : 1420

-----
----
```

```
120mm:  ENERMAX T.B. Silence UCTB12P

[FAN2, FAN3]

Max Speed: 1500 (+/- 10%) RPM

Min Speed: 500 (+/- 10%) RPM

Lower Non-Recoverable      : 275
Lower Critical              : 350
Lower Non-Critical         : 450

Upper Non-Critical         : 1650
Upper Critical              : 1725
Upper Non-Recoverable      : 1800
```

To access the fan settings, I used ipmitool. To view your Sensors currently hooked up to IPMI, use the

```
```ipmitool sensor list all```
```

command.



```
[root@freenas] ~# ipmitool sensor list all

CPU Temp          | 32.000          | degrees C  | ok   | 0.000          | 0.000
| 0.000          | 95.000          | 100.000     | 100.000

System Temp       | 38.000          | degrees C  | ok   | -9.000         | -7.000
| -5.000         | 80.000          | 85.000       | 90.000

Peripheral Temp   | 39.000          | degrees C  | ok   | -9.000         | -7.000
| -5.000         | 80.000          | 85.000       | 90.000

PCH Temp          | 45.000          | degrees C  | ok   | -11.000        | -8.000
| -5.000         | 90.000          | 95.000       | 100.000

VRM Temp          | 34.000          | degrees C  | ok   | -9.000         | -7.000
| -5.000         | 95.000          | 100.000     | 105.000

DIMMA1 Temp       | 28.000          | degrees C  | ok   | 1.000          | 2.000
| 4.000          | 80.000          | 85.000       | 90.000

DIMMA2 Temp       | 28.000          | degrees C  | ok   | 1.000          | 2.000
| 4.000          | 80.000          | 85.000       | 90.000

DIMMB1 Temp       | 27.000          | degrees C  | ok   | 1.000          | 2.000
| 4.000          | 80.000          | 85.000       | 90.000

DIMMB2 Temp       | 26.000          | degrees C  | ok   | 1.000          | 2.000
| 4.000          | 80.000          | 85.000       | 90.000

FAN1              | 1300.000        | RPM        | ok   | 300.000        | 500.000
| 700.000        | 25300.000      | 25400.000   | 25500.000

FAN2              | 1000.000        | RPM        | ok   | 0.000          | 100.000
| 200.000        | 1600.000       | 1700.000    | 1800.000

FAN3              | 900.000         | RPM        | ok   | 0.000          | 100.000
| 200.000        | 1600.000       | 1700.000    | 1800.000

FAN4              | 700.000         | RPM        | ok   | 0.000          | 100.000
| 200.000        | 1300.000       | 1400.000    | 1500.000

FANA              | 700.000         | RPM        | ok   | 0.000          | 100.000
| 200.000        | 1300.000       | 1400.000    | 1500.000

Vcpu              | 1.818           | Volts      | ok   | 1.242          | 1.260
| 1.395          | 1.899          | 2.088        | 2.106

VDIMM             | 1.320           | Volts      | ok   | 1.096          | 1.124
```

VDIMM	1.320	Volts	ok	1.096	1.124
1.201	1.642	1.719	1.747		
12V	12.102	Volts	ok	10.164	10.521
10.776	12.918	13.224	13.224		
5VCC	5.031	Volts	ok	4.225	4.380
4.473	5.372	5.527	5.589		
3.3VCC	3.344	Volts	ok	2.804	2.894
2.969	3.554	3.659	3.689		
VBAT	3.060	Volts	ok	2.400	2.490
2.595	3.495	3.600	3.690		
AVCC	3.329	Volts	ok	2.399	2.489
2.594	3.494	3.599	3.689		
VSB	3.269	Volts	ok	2.399	2.489
2.594	3.494	3.599	3.689		
Chassis Intru	0x0	discrete	0x0000	na	na
na	na	na	na		

Fan Adjusting

To get rid of the cycling, I adjusted the lower thresholds as low as possible.

To set the bottom three lower thresholds use:

```
ipmitool sensor thresh <sensor> lower <lnr> <lcr> <lnc>
```

1. Set bottom thresholds:

```
...

ipmitool sensor thresh FANA lower 0 100 200

ipmitool sensor thresh FAN4 lower 0 100 200

ipmitool sensor thresh FAN3 lower 0 100 200

ipmitool sensor thresh FAN2 lower 0 100 200

ipmitool sensor thresh FAN1 lower 300 500 700

...
```

2. Set top thresholds:

```
...  
  
ipmitool sensor thresh "FANA" upper 1300 1400 1500  
  
ipmitool sensor thresh "FAN4" upper 1300 1400 1500  
  
ipmitool sensor thresh "FAN3" upper 1600 1700 1800  
  
ipmitool sensor thresh "FAN2" upper 1600 1700 1800  
  
...
```

Post Setup

FreeNAS makes it easy to setup most common server applications with their plugin system. There are common plugins such as media servers like Plex and emby, or data syncing applications like OwnCloud.

While FreeNAS does not have a huge repository of plugins, when you need something that isn't provided, you can easily set it up yourself in a jail. There are templates of FreeBSD jails and even VirtualBoxphp jails that can easily be made with the click of a button.

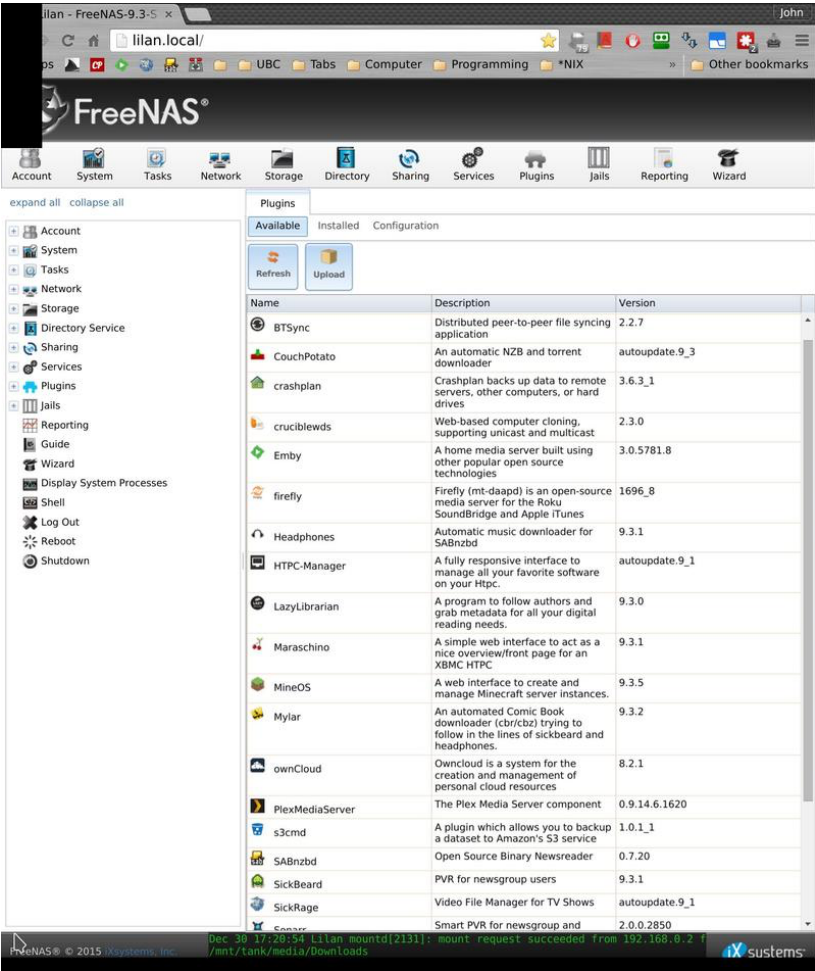


Figure 10. Plugins.

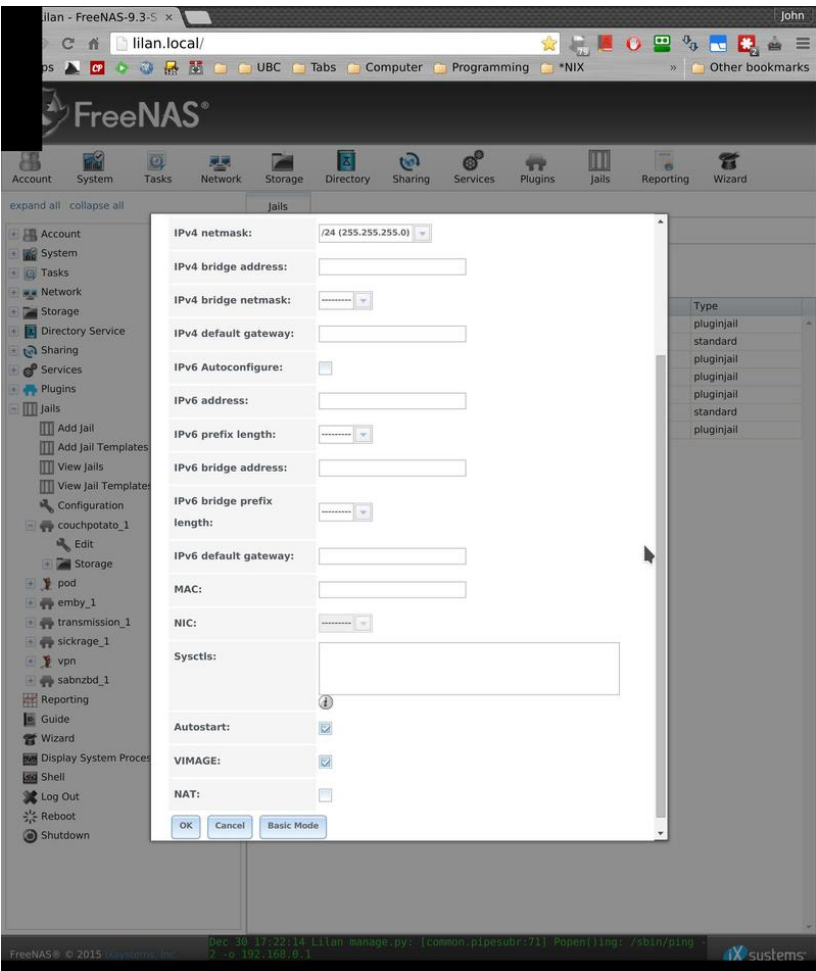


Figure 11. New jail.



What's cool about FreeNAS is how everything related to the operation of the server is completely self-encapsulated. Every time you install a plugin or something extra, it is kept by itself in a FreeBSD jail where even if it does go berserk, it has no chance of destroying the rest of your system.

## Conclusion



*Figure 12. Server on stand.*

In the time I've used the server since setting it up, I have found it very easy to use. It's been sitting here beside my desk quietly humming along just loud enough to let me know it's there.

When I did have problems, resorting to the FreeNAS documentation usually allowed me to figure things out myself. The documentation contains examples and instructions for most of the core tasks and has obviously had a lot of thought and time put into it.

FreeNAS has a lot of really cool features and in particular has taken advantage of ZFS. Using a file system that lets me take snapshots of my data, and then roll back when I mess something up, has been invaluable. I have used several of the built-in FreeNAS plugins and they have been very easy to install and use. If I do screw something up while changing my plugins or jails it is nice to know that I am able to revert back to when I had my configuration working properly.

When setting things up in FreeBSD jails, I have found it to be as easy as installing ports or packages on vanilla FreeBSD, if not easier. FreeNAS takes care of making your template jails which you can easily administer from the graphical interface. That is one of the nicest things about FreeNAS: it is extremely powerful if you decide to take advantage of the more advanced features, but it is also reliable and easy to use if you don't. I'd recommend it to anyone wanting to complete a similar build.



## About the Author:

John Ramsden is a 24-year-old student at the University of British Columbia: he is currently studying Computer Engineering, while engaging in passion projects on the side. Eventually, John hopes to pursue a career in the field of Software Engineering in a professional capacity after he graduates.

Website: [ramsdenj.com](http://ramsdenj.com)

## 7 Best Practices for Your Enterprise's Journey to the Cloud

*Attributed to Stephen Orban, Head of Enterprise Strategy at AWS*



**This article serves as an introduction to my new thinking, and lays out seven best practices I've seen in enterprises that are delivering results on their Journey. Over the course of the next few months, I'll dive deeper into each best practice and talk about some of the things I've seen work (and not work) for each. I'd love to get your feedback along the way, so please send me your experiences or thoughts as this series comes together.**

Before we get into these practices, it's worth reiterating that the Journey is an iterative process that takes time. Because the cloud is disrupting the way IT is delivered and consumed, you have a tremendous opportunity to scrutinize and rethink the way IT operates in your organization. Put another way, the Journey is a change-management exercise. It will touch your technology, governance, job functions, org chart, and many other aspects of your company. The good news is that the Journey is being traveled by thousands of companies already, and we can all learn from each other.

Here are the seven practices that I've observed working together to create a flywheel of success for enterprises on their Journey:

### **1. Provide Executive Support**

Top-down support is essential for creating meaningful change—whether that change be technical or cultural. The CIO/CTO role is always evolving, and today more than ever technology executives need to be the company's Chief Change Management Officer (CCMO™). Doing this job includes getting the support of the executive team and giving support and air cover to your own team. It means providing clarity of purpose, aligning business and technical objectives on desired outcomes, and making (or breaking) new rules.

## 2. Educate Staff

People tend to be afraid of what they don't know. When they're afraid, they're more likely to cling to what they're comfortable with. In some cases, this can create roadblocks in your Journey. Equipping your staff with new skills is a great way to mitigate their fears. Acquiring new talent with the appropriate skills is great, but this method is unlikely to scale on its own. Giving those with institutional knowledge an opportunity to learn and participate will accelerate your Journey.

## 3. Create a Culture of Experimentation

The cost of experimenting in the cloud pales in comparison to that of on-premises environments. There are little to no up-front costs in the cloud, and no commitments to weigh you down if something doesn't work out. When you look at each project as an experiment you can learn from, you're likely to create an educational flywheel that will help the organization improve over time. Some enterprises will start with a single project in a single part of IT; others will tackle many projects at once. Whatever strategy suits your organization, make sure to celebrate successes and institutionalize what you learn from failures. Coupled with the right executive support, you have an opportunity to create an ongoing culture of experimentation.

## 4. Engage Partners

Most enterprises engage with some number of partners to deliver IT. These partnerships come in many shapes and sizes: staff augmentation, solutions delivery, managed services, licensed software, SaaS solutions, and so on. Every major IT services provider has had to determine how the cloud fits into their

business, and many are making themselves available through the AWS Partner Network. You can look to your existing partners to help you on your Journey, or turn to any number of the born-in-the-cloud companies who have grown respectable businesses over the past few years. AWS would be happy to help you determine which partner is right for your needs. On top of this, many partners are making their solutions available in the AWS Marketplace, where you can procure and deploy their services the same way you procure AWS, which can greatly reduce oftentimes bureaucratic procurement processes.

## 5. Create a Center of Excellence

Throughout my career, I've often observed tension between application delivery and infrastructure teams. This system of checks and balances can be healthy, but I've also seen it become toxic. With the cloud taking away much of the heavy lifting associated with traditional infrastructure, and being heavily driven by code and automation, the line between these teams becomes much more blurry. The Journey creates an opportunity for organizations to rethink these boundaries and the protocols between them. Most organizations that I've seen that move swiftly through their Journey have created a Cloud Center of Excellence to institutionalize best practices, governance, and automation throughout the organization. When I was the CIO at Dow Jones, for example, we implemented this through our DevOps team, with a focus on excellent customer service, a run-what-you-build mindset, and a solid knowledge of what to expect in the months after implementation.



## 6. Implement a Hybrid Architecture

Most, if not all, enterprises have existing IT investments that are still providing benefit to the organization. Every organization approaches how it manages its legacy and refresh cycles differently, but none will be able to make an overnight move. Setting up a hybrid architecture allows you to get the most out of the cloud while still being able to take advantage of your existing investments. No provider has more experience or breadth in their hybrid offering as AWS does. So long as you avoid the three myths of a hybrid architecture, your center of excellence can get you up and running with a hybrid architecture in no time. Once this is in place, it becomes much more straightforward to enhance and migrate legacy applications. Hybrid creates a great opportunity to start chipping away at monolithic ap-

plications and implement decoupled services, which is a common pattern I've seen for dealing with mainframes.

## 7. Implement a Cloud-First Policy

As you gain experience, your organization will hit a tipping point. With the previous six pistons spinning your flywheel, you're likely to become more efficient at operating IT in the cloud than you are on-premises. At this point, I've seen companies declare a cloud-first strategy, where they reverse the burden of proof for the IT projects from "why cloud?" to "why not cloud?" This sends an important message to the organization, and sets the stage for you to maximize the benefits from the cloud and devote more of your resources to your core business.

### Editors' Note

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## Cloud is Changing how Security Professionals and Enterprises Think about Innovation

*Attributed to Steve Schmidt, Chief Information Security Officer, Amazon Web Services*



**Think of your stereotypical security professional in your IT department. Usually extremely intelligent, risk averse, dashing good looks (if I do say so myself...) and the first person to shut down any new idea within an organisation.**

This has, traditionally, painted security as a blocker and has led to it being seen as a “no” department with many projects never seeing the light of day. In the past, this was a limiting factor for large enterprises, particularly when they are under pressure internally, from line of business functions, and externally, from shareholders and customers, to innovate. Without the budget, or human resources, to fully investigate the security requirements needed for every new project, new initiatives simply got deprioritised or shut down altogether.

Something we have seen in the past few years, however, is that the cloud is changing this. We are seeing security departments embrace innovation due to the ability they have to leverage the security investment and expertise of a cloud provider. This is because

they realise cloud providers invest in more security policing and countermeasures than almost any company can afford themselves. In this model, the customer is only responsible for securing from the operating system up, and the cloud provider from the hypervisor down, meaning businesses can focus on the application’s security and not on the physical and logical security surrounding the infrastructure. This is giving organisations of all sizes access to technology infrastructure on-demand that is secure by default and is accredited to global standards, such as ISO 27001, ISO 27017 (AWS is the first cloud provider to achieve this certification), SOC 1, 2, 3 and PCI DSS Level 1. Some, such as AWS, have even had their Data Processing Agreements signed off by the highest levels of government within Europe.

This reassures even the most security conscious organisations, such as those in the Financial Services Industry (FSI), that they can quickly procure secure infrastructure on-demand, over the internet.

As a result, many financial services companies around the world are embracing cloud computing. In the UK, organisations such as Royal Sun Alliance Insurance and FTSE 100 listed, wealth management firm, St James's Place are moving large swathes of their infrastructure to the cloud. In Spain, Bankinter, listed among the top 10 banks in Spain, and Mapfre, the largest insurance company in the country, also moved part of their infrastructure to the cloud looking for the flexibility and scalability they couldn't find in on-premise infrastructure. In other cases, the cloud is opening up classic innovation activities, like hack days or hackathons, to those in the FSI space with many using secure cloud platforms as a way for their traditionally security conscious organisations to innovate. A good example here is Bank Hapoalim, Israel's largest bank. Bank Hapoalim recently ran a hackathon using anonymised retail banking data stored in the cloud. The bank then invited the Israeli developer community to a hackathon and use their

imagination to develop new financial applications that help them to better understand their customers and give them a better banking experience. Traditionally, banks would never have imagined giving developers unfettered access to their infrastructure in order to help them innovate but by using the cloud, they are able to get infrastructure that is secure by default and is able to scale to many more concurrent users than their own infrastructure could do themselves. This is allowing the bank to crowd source innovation and helping turn their security department into one that embraces invention and helps the bank to grow.

This is just one of the thousands of examples we are seeing in industries from financial services to retail, from Utilities, to Oil and Gas and from Transport to the public sector where customers have investigated the default security they are able to achieve with the cloud and embracing it as an innovation platform. As a result, we are seeing security professionals change their tune and are starting to fit a new stereotype – one that is extremely intelligent, prioritises the security and privacy of their users, has dashing good looks and is amongst the first to embrace new ideas and innovations within an organisation.

## Editors' Note

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# Model View Whatever - Forms and Controls influence

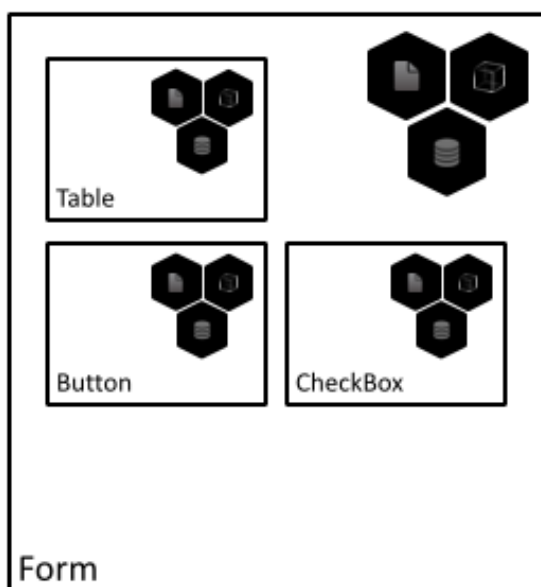
*by Damian Czernous*

In the '70s, engineers mostly worked on creating and manipulating widgets. The MVC seems to be the right structure for that task. Model fits the need of storing data related to the single widget. View renders graphical representation of the widget with data. Widgets communicate with each other through the model. The model using Observer Synchronisation broadcasts any changes to all interested widgets (views), so they can update. Separated Presentation and Observer Synchronisation are key mechanisms of MVC widely accepted by the engineering community.

In the '80s, engineers started to use widgets as libraries for their applications and prefer to understand the view more accurately to their needs, as a screen full of widgets. This style of thinking, called Forms (screen) and Controls (widgets), now seems to be preferred.



*Figure 1. Original MVC scope.*



*Figure 2. Forms and Controls Scope.*

The MVC faces a new reality. View becomes a form of widgets. Model describes data displayed on a form (domain data). This is possible because such thinking follows the general thought behind the pattern. But new view (form scope) introduces a new kind of data related to the form stylings and states. Screen Model (new data) and Domain Model put together in one model class violates the SoC principle.

In that sense, MVC structure fails to implement the idea behind the pattern. However, MVC with Application Model (Application Model is a mature form of Presentation Model) addresses quite well challenges of upcoming reality. More explanation can be found in previous paper Model View Whatever - MVC's model evolution.

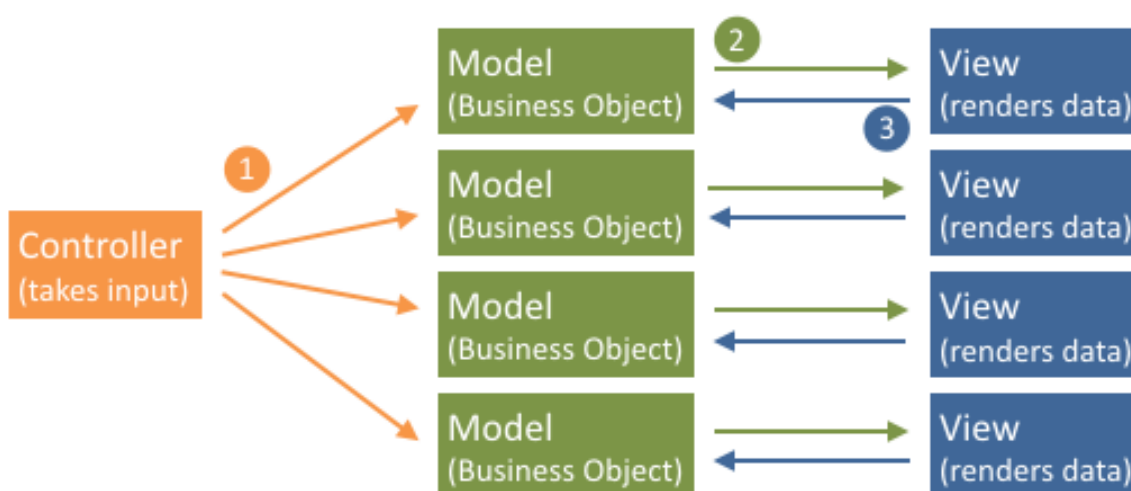
## Forms and Controls

The idea follows the way the human brain prefers to work. On display, the user sees a form (application) full of widgets that are organised into smaller forms that cooperate together (many MVCs with AM). The idea not only stimulates MVC to evolve, but also spreads on Integrated Development Environments (IDEs) that allow users to code Graphical User Interfaces (GUIs) by dragging and dropping controls on a form. In that tools, writing code by hand is limited to the presentation logic and other not GUI related parts. However, engineers quickly realise that code generation tools work fine only if a human being does not have to read generated code. These days, such UI design-

ers are mostly used for doing proof of concept rather than product development.

## MVC is for widgets

MVC is a structure to design a single widget e.g. table. In order to implement the Forms and Controls idea, MVC gets Application Model (AMVC), e.g. form of controls (table, button, etc.). AMVCs communicate through models that broadcast changes to all interested views for update (Observer Synchronisation mechanism). AMVC keeps all essentials of the MVC, implements the Forms and Controls idea and becomes something different than MVC.



**Figure 3. MVCs with Application Model communicate through models.**

## Desktop apps and the Web

MVC is a UI pattern thus in the Web world should exist entirely on the Web side. This cannot be done with HTML, but it is possible with JavaScript and HTML.

Initially, there are attempts to adopt philosophy behind MVC to the Web based applications by splitting the pattern between client (browser) and server (e.g HTTP Server) side, e.g. PHP and HTML. But in such composition Observer Synchronisation mechanism cannot be utilised. Model cannot notify HTML for an update. Besides, MVC adaptation does not mean MVC anymore.

Modern web UI frameworks either hide the web from an engineer, e.g. Vaadin, or reside on the web, e.g. Angular. Depending on the chosen framework, it might be possible to follow AMVC, e.g. it is possible with Vaadin which pretends desktop UI framework, but not possible with Angular which follows Model View ViewModel communication style.

In short, web applications do not follow MVC. Desktop applications do not follow MVC either. Trygve Reenskaug introduces MVC in 1979 as a structure to compose widgets in Smalltalk language. This is before the Internet (1982). In 1988, MVC shows up again as an idea, this time, for desktop apps. Forms and

Controls appears in '90s (AMVC). In 1991, finally the web comes true.

## MVC is not an architecture

Robert Cecil Martin said: „architecture is about intent”. Architecture describes what a particular application can do, but not how it does it. MVC designs widgets. It is not even close to intent. AMVC answers the question about how to realise intent therefore should not speak through architecture. This means no packages like controller, helper, log, view, etc. Instead something meaningful such as `bakery.product.overview`, `bakery.product.editor`, etc.

## In next paper

Forms and Controls differs from MVC, e.g. it uses Flow Synchronisation mechanism. MVC with Application Model implements only the idea of seeing view as a whole screen. Later developed Model View Presenter adopts best of both worlds which becomes a natural candidate for the next paper Model View Whatever - MVP's view evolution.

## About the author:

Damian Czernous

Reasoning about software architecture fascinates me for 10 years now.

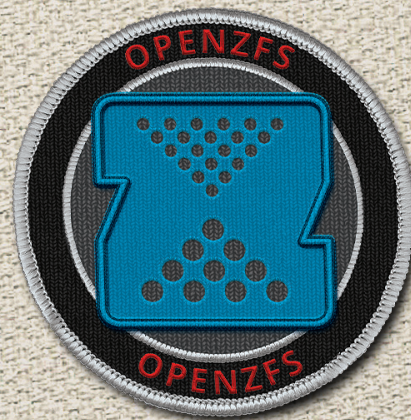
Lead Engineering Coach at Nokia.

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## With the recent revelations that Steve Jobs and many others in Silicon Valley consumed psychedelics to aid creativity, has the Valley finally sunk to the levels of other business sectors??

*by Rob Somerville*

Drugs and creativity have a long history intertwined with those who seek revelation and understanding “outside the box”. Poets, writers, artists and musicians have always attempted to push the envelope in as many ways as possible, but it has only been since the Second World War, and specifically the 1960's, that many forces have combined to make drug use attractive, if not legal. Mass cultural appeal, easy of availability, low cost and a sense of belonging to a non-establishment group have all allowed the tentacles of the drug trade to permeate the infrastructure of society like the pernicious *Fallopia japonica* – Japanese knot-weed. Like the plant, the drug culture runs through the very fabric of society, as a recent chemical analysis showing extensive cocaine deposits on toilet cistern lids in the UK house of Commons revealed. With the financial crash of 2008, the banking sector has a major quandary on its hands – not only is public pressure being applied for transparency, but the sector understands the financial implications of not just money laundering, but the sheer amount of GDP tied to this illicit trade, estimated in 2003 to be 0.9% globally (a figure that to all intents and purposes is incredibly conservative). If the banks themselves are too big to fail, then the drug

dealer is too large a customer to comfortably ostracise.

Pragmatically, the whole drug issue has continually been a monstrous tug of war between the prohibitionists and the criminal (and liberal) forces in society. In Victorian times, morphine, heroin and opium were freely dispensed from chemists shops, while Coca Cola built a brand with a drink that contained cocaine until it was decided by the establishment that people of colour went crazy on it. The First World War and the US prohibition changed all that, along with legislation bringing in income tax and various other measures on a “temporary war basis” that were never repealed. Worse still, there is considerable historical evidence that demonstrates that the rise of the Mafia in the US was a direct unintended consequence of the prohibitionist agenda, and if we are truly honest with ourselves, the long term misery, corruption and social instability that this has brought has far outweighed any benefits that 13 years of an alcohol free society delivered.

And so the argument rages. scientists, doctors and the establishment argue continually about the benefits and consequences of drugs, none willing to grasp the fundamental concept that throughout the ages society has always had three immutable elements – God, Music and Drugs. Trying to ban drugs (and in this definition we need to include alcohol, caffeine and nicotine) is about as pointless a cultural exercise as banning the other two. That is not to say that certain dictators and societies have not tried, but the results inevitably culminate in a very bleak ending. As to the author, I am ambivalent to the nanny state – I believe that personal responsibility is key, and as a lifetime smoker in my elder years am beginning to suffer the ravages of cigarettes on my lungs - which should in theory alter my position here - but tragically does not. While my lungs are crying out “Idiot”, both my heart and my head are glad that I live in a society where I am allowed to make an individual choice – albeit satisfying my flesh crying out for some nicotine. Such is the difficulty and conflict of the addict, and while there are those that yell “Society has also suffered because of your selfishness”, I personally fail to see where the solution lies. We all have feet of clay, and examining the motivation for taking “drugs” boils down to some simple factors – stimulation, anaesthesia, group identity or addiction. Outside of these effects, chemicals that alter brain chemistry have little appeal other than strictly medicinal. On balance, the amount of damage I have done to others is probably close to non-existent, unlike the alcoholic or crack addict. The biggest curse and moral concern of course, is those making decisions while inhabiting alternative universes, and there are

plenty of these who have reached this zenith of idiocy while being as straight as a ruler, never mind those I have heard about in advertising and banking who regularly imbibe in drugs that affect the decision making process. In some strange way, my smoking is an ironic defence mechanism against participating in all the lunacy. I'd rather be a smelly, short of breath outsider than join in with the madness of group-think. Self control – like tissue paper – is a very fragile and complex mechanism.

So what are we to make of the revelation concerning Steve Jobs? To the informed individual, it should be no surprise that the West coast of the States – being the bedrock of the word “alternative” - has not facilitated the entrepreneur and visionary to dabble in psychedelics. Many cultural changes have emerged from the region, embedded in the foundation of “free love” and the 1960's flower power movement. The adoption of the philosophy of Ayn Rand, the author of *Atlas Shrugged*, by many visionaries gives us a clue. In the search for bigger, better and brighter, ways must be found to burst through convention and restraint. Bringing change to society, and indeed the world, is not an easy task, as those that wish to maintain the status quo will resist with every weapon in their arsenal. Even with huge advertising budgets and a strong media presence, revolution is not always guaranteed. The classic case in point being VHS versus Betamax, or Windows versus OS/2 to name but a few. The former of these two went on to dominate whilst the technologically superior were dispatched to the waste bin of history.



All the engineers, design team and supporting cast were no doubt as committed as each other to changing the world, but only one came out on top. Was it money, luck, vision, strategic skulduggery? Sacrificing animals in some deserted graveyard somewhere? I don't know. What I do know is there is no formula for success at this level – every corporate has suffered from the ravages of the fickle free marketplace, and if there was a formula, there would be a very rich and successful consultancy out there offering 100% brand placement success.

I suspect that Steve Jobs was indeed pure in his motives in trying to understand more about himself, his universe, and how to make things better. That is what he achieved, unequivocally from a design standpoint. Ironically, through the mechanism of corporatism, legal constraints, and the sheer pressures of the free market, the company and to a degree the brand itself, has become tarnished and divorced from any possible idealism, value or revelation that any psychedelics may have provided. Sadly, Apple is now as establishment as Coca Cola - post cocaine.

